# DOCUMENT RESUME

ED 104 654 SE 018 645

| | |
|---|---|
| TITLE | Environmental Quality, the Fourth Annual Report of the Council on Environmental Quality. |
| INSTITUTION | Council on Environmental Quality, Washington, D.C. |
| PUB DATE | Sep 73 |
| NOTE | 525p. |
| AVAILABLE FROM | Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 (Stock No. 4111-00020, $4.30) |
| EDRS PRICE | MF-$ 0.92 HC-$26.02 PLUS POSTAGE |
| DESCRIPTORS | *Annual Reports; *Environment; *Federal Government; Federal Legislation; Natural Resources; Pollution; *Quality Control; State of the Art Reviews; World Problems |
| IDENTIFIERS | National Environmental Policy Act of 1969 |

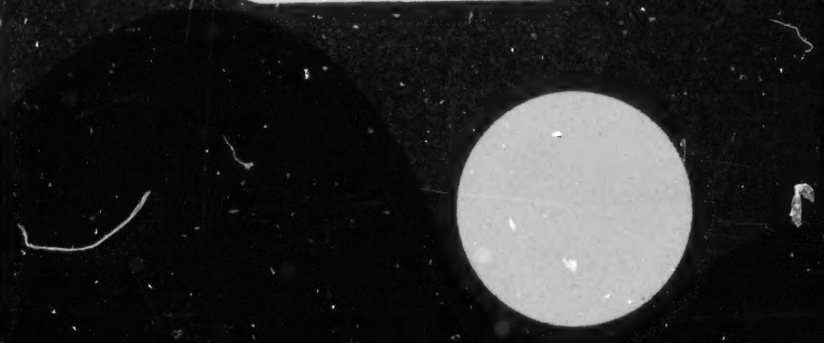
ABSTRACT

The state of the environment and efforts to improve it are reported upon in this Fourth Annual Report of the Council on Environmental Quality. Broad in scope, the report covers federal and state activities during the past year, the urban environment, economics and environmental management, the law and land use regulation, environmental quality, status, and trends, and the citizen's role in environmental improvement. The chapter on international action to protect the environment not only reviews international environmental accomplishments of the past year in a historical perspective, but also deals with specific substantive areas such as protection of the oceans, control of transboundary pollution, and preservation of the world's wildlife and natural areas. The chapter on environmental status and trends provides information on status and trends in environmental quality--whether particular facets of environmental quality are improving or deteriorating and what current conditions are. Four major aspects of the environment are covered: air pollution, water pollution, land use, and population. The final chapter, The Citizen's Role in Environmental Improvement, describes the environmental movement as it is constituted today--the variety of environmental organizations, their interests and activities, their resources and their problems. (BT)

ED104654

# environmental quality

U S DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY



the fourth annual report
of the council
on environmental
quality

SE018 645

## Publications of the Council on Environmental Quality:*

Environmental Quality—The First Annual Report of the Council on Environmental Quality

Ocean Dumping—A National Policy

The President's 1971 Environmental Program

Toxic Substances

Environmental Quality—The Second Annual Report of the Council on Environmental Quality

The President's 1972 Environmental Program

Environmental Quality—The Third Annual Report of the Council on Environmental Quality

Integrated Pest Management

The President's 1973 Environmental Program

The Federal Environmental Monitoring Directory

Energy and the Environment—Electric Power

*Available at the U.S. Government Printing Office

# environmental quality

the fourth annual report
of the council
on environmental
quality

september
1973

4

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402—Price $4.30
Stock Number 4111-00020

# The President's Message

# The President's Message

*To the Congress of the United States:*

I am pleased to transmit to the Congress the Fourth Annual Report of the Council on Environmental Quality.

The year 1970, when I transmitted the Council's First Annual Report, signalled a time of great environmental awakening in the United States. Much has been accomplished in the succeeding three years.

In place of organizational disorder and fragmentation, we have developed institutions capable of dealing with environmental problems in a systematic and effective way. At the Federal level, the Council on Environmental Quality and the Environmental Protection Agency were established in 1970. Most States have created similar offices, giving greater prominence and coherence to their own environmental programs.

We have also enacted new and stronger environmental protection laws and have made substantial progress in defining problems, establishing goals, and designing strategies for abating pollution and preserving our natural heritage. The chapter in this report entitled "Perspectives on Environmental Quality" describes the important progress we have made. In some instances, such as in the control of air pollution, the national program is well advanced. In other areas, such as noise pollution, our work is just beginning. But in all areas, our knowledge about the environment and our capacity to protect and preserve it increase day by day.

Our energies have not been confined to domestic environmental problems. In the world community we have provided strong leadership in responding to environmental concerns and in fostering international efforts to solve problems which transcend national boundaries. The chapter "International Action to Protect the Environment" summarizes the progress made in recent years in protecting the oceans, controlling transboundary pollution, and preserving the fragile natural heritage of our planet.

Other chapters in this report further illustrate the gains that have been made. American initiative—our ability to solve problems rather than simply bemoaning them—has increasingly been turned to environmental improvement in recent years, and the results are becoming evident in one area after another.

The chapter on "Cleaning up the Willamette," for example, shows that a grossly polluted river can be restored to purity and health. Fifty years ago this Oregon river was offensive to the senses. Now the waters are clean and salmon migrate upstream in the fall. The people of Oregon, whose determination brought about the cleanup, are now taking action to preserve and assure public access to the shoreline of this restored river.

The chapter entitled "The Urban Environment—Toward Livable Cities" describes new signs of life and vigor in our cities and shows what private citizens can do to create urban environments that enhance the quality of life.

The chapter on "Environmental Status and Trends" indicates that the air quality in our cities is improving. Further progress will occur as the Clean Air Act continues to be carried out.

As in so many other areas of national concern, our progress should inspire us to get on with the job that still remains. In my Natural Resources and Environmental Message in February, I resubmitted 19 bills for Congressional action and also submitted several new proposals. Some of the most important measures—including proposals for the regulation of land use and the control of toxic substances—have been before the Congress for 2½ years. Passage of these measures is crucial to the environmental well-being of America. The time for action is now.

Land use control is perhaps the most pressing environmental issue before the Nation. How we use our land is fundamental to all other environmental concerns. There is encouraging evidence that the American people have reached a new perception and appreciation for this challenge. In our past, we wrestled a nation out of wilderness. We cleared and developed the land. If we despoiled it, there was always fresh land over the horizon, or so it seemed. But now we know that there must be limits to our use of the land, not only limits imposed by nature on what the land can support, but also limits set by the human spirit—for we need beauty and order and diversity in our surroundings.

I believe that land use regulation should be primarily a responsibility of local governments, where responsive leaders are most likely to understand the choices that have to be made. Nevertheless, I am also convinced that Federal legislation is needed now both to stimulate and to support the range of controls that States must institute. I urge the Congress to enact my proposal for land use control, a proposal which would authorize Federal assistance to encourage the States—in cooperation with local governments—to protect lands of critical environmental concern and to control growth and development which has a regional impact.

I also urge the Congress to act quickly to prevent continued ravaging of our land and water through uncontrolled mining. My proposed Mined Area Protection Act would establish Federal requirements to regulate surface and underground mining. By requiring mining operators to post adequate performance bonds and satisfy stringent Federal reclamation standards, this legislation would require that mined lands be restored to their original condition or to a condition that is equally desirable. We need the fuels and minerals that are now in the earth, but we can—and must—secure them without despoiling and devastating our landscape.

There is other important land use legislation pending before the Congress which also deserves prompt enactment. The Powerplant Siting Act would assure that needed generating facilities are constructed on a timely basis with full consideration of environmental values. The National Resource Land Management Act would provide a management policy emphasizing strong environmental safeguards for the one-fifth of our Nation's land area that is managed by the Bureau of Land Management.

Because a number of differing values and perspectives must be reconciled, the regulation of land use will never be a simple matter. The "Perspectives" chapter of this report describes the anti-growth sentiment emerging in some communities and points to the need to reconcile controls on unwanted growth with provision for essential regional development. The chapter on "The Law and Land Use Regulation" discusses the balance which must be struck between the need to protect private property and the need to preserve the environment. This is not a question to be dealt with from Washington, however, but one that State and local governments and the courts must work out. The Council's chapter on this subject should be helpful to these groups, the legal profession, and private citizens in developing a more complete understanding of this important issue.

In the final analysis, the struggle for environmental quality rests with the citizens of our Nation. The chapter on "The Citizen's Role in Environmental Improvement" shows that concern for the environment is not merely a passing fad but rather has become an integral part of American life.

The Fourth Annual Report of the Council on Environmental Quality demonstrates our considerable progress in arresting environmental decay. It also helps to chart the path we must follow if we are to continue this progress in the future. I commend the members and staff of the Council for their efforts in producing this valuable document, and I urge the Congress and the public to give this report their full and careful consideration.

Richard Nixon

The White House, *September 1973.*

# The Fourth Annual Report of the Council on Environmental Quality

10

EXECUTIVE OFFICE OF THE PRESIDENT
COUNCIL ON ENVIRONMENTAL QUALITY
722 JACKSON PLACE, N. W.
WASHINGTON, D. C. 20006

## LETTER OF TRANSMITTAL

THE PRESIDENT:

Sir: The Council on Environmental Quality herewith submits its fourth Annual Environmental Quality Report, September 1973, in accordance with Section 201 of the National Environmental Policy Act of 1969 (42 U.S.C. 4341).

Respectfully,

Russell E. Train

Russell E. Train
Chairman

John A. Busterud

John A. Busterud

Beatrice E. Willard

Beatrice E. Willard

# Highlights

## 1 The Urban Environment

This chapter describes efforts to make our cities better places to live, work, and visit. It focuses on those elements that lead to vitality and diversity in downtown areas and in urban neighborhoods. By trying to identify mistakes and successes, the chapter seeks to help people make better decisions about their own communities and the kind of environment they provide.

- There are places in some of our cities where people and things are coming together, where vitality persists or has reappeared, and where citizens have successfully checked attempts to repeat the mistakes of the past. (p. 1)
- The fact is that most of our cities will not be torn down or completely rebuilt in our lifetime. (p. 2)
- [We should] blend the old and the new in a way that preserves the character and personality of our cities and uses the elements unique to each of them as guides for progress and change. (p. 4)

### Downtown—the City as the Center of Things

- The most obvious characteristic of downtown in American cities is its increasingly uniform appearance from coast to coast. (p. 4)
- High-rise commercial structures . . . increase the value of nearby land for parking lots and [cause] the loss of the smaller older structures which previously set off the taller buildings and made them visually acceptable. (p. 5)
- The downtown areas of American cities that work as places that attract people are those that have kept and enhanced with new construction the mix of uses and mix of scales that have long marked the character of the city and given it its unique flavor. (p. 9)
- There are many . . . fine examples . . . of older buildings which have been saved, not as museums or artifacts of another era but as active and economically viable structures lending a variety of architectural style to their downtown areas. (p. 9)

- Those cities where people live in or near downtown seem to stay alive more, to serve as the center of things not just from 9 to 5 but around the clock. (p. 16)

### Neighborhoods—the City as a Place to Live

- After many years of continued movement to the suburbs, there is beginning to arise in many American cities a sense that perhaps the city is a good place to live. (p. 22)
- Many restored historic neighborhoods have become today the most prestigious addresses in the metropolitan area. . . . If anything, the problem today in many historic neighborhoods is that they are *too* chic, *too* elitist, and need more diversity of residents. (p. 24)
- Those who are attracted to [older] neighborhoods and undertake to rehabilitate one of the old homes are often faced with major obstacles. [For example,] [f]inancial institutions may be reluctant to help with loans and mortgages until the neighborhood has undergone substantial upgrading. (p. 27)
- [T]he challenge for many cities [is] to upgrade and preserve viable, older neighborhoods without dislocating the resident populations. (p. 29)
- There needs to be more respect for different kinds of uses coexisting, for assuring each neighborhood its share of shops and convenience stores without overburdening it with strip commercial development. (p. 36)

### Conclusions

- The major unanswered question is the impact that these first small signs of change will have on two large masses of Americans—the relatively underprivileged in the city and the relatively affluent in the suburbs. (p. 39)

## 2 Cleaning up the Willamette

This chapter describes how the Willamette River in Oregon, formerly one of the Nation's most polluted waterways, was transformed into a clean river. It also looks at the land along the Willamette and the effort in the countryside and in the city of Portland to secure the benefits of clean water for the public by protecting natural values and securing access for the people.

### Water Quality Restored

- Fifty years ago men refused to work on riverside construction because of the water's intolerable stench. Now thousands regularly swim, fish, water ski, and boat on summer weekends and for the first time Chinook salmon ascend the Willamette to spawn in the fall. (p. 43)
- Without doubt the single major factor behind the cleanup of the Willamette was the strong commitment and concern of the people of Oregon. (p. 57)

### Land along the River

- We may turn now to the question of land use along the Willamette River and how the benefits of improved water quality are to be enjoyed. Will the public, which has paid for the restoration of the river, enjoy it? Or will public access to the waters be blocked? (p. 60)
- . . . the Greenway, a parkway stretching continuously down both banks of the Willamette. . . . It would be one of the longest parks in the world, a bit of unspoiled wilderness for camping, swimming, boating, fishing, hiking, and riding—accessible to all. (p. 62)
- Will easements give security to all parties, both farmers—that their vegetables will not be stolen or their irrigation pumps vandalized—and the general public—that pleasing farm land will not be developed next week or next year? (p. 66)
- When the Willamette was virtually an open sewer, it could be cut off from the rest of the city by factories, freeways, wharves, and unsightly open lands without much loss to the public. . . . But when a river becomes clean . . . the absence of parks, piers, restaurants, shops, marinas, promenades, and other avenues of access becomes a cause for concern, and it becomes important to transform land use on the banks from those of the past to ones more suitable today. (p. 67)

## 3 Economics and Environmental Management

This chapter probes the relationship between economics and the shaping and implementing of environmental policy. After describing the four types of environmental costs—abatement costs, avoidance costs, transaction costs, and abatement costs—it estimates the magnitude of abatement costs and analyzes how costs are distributed across different income levels. The chapter also discusses several analytical problems in quantitative decisionmaking.

- [This year's chapter] concentrates on three fundamental questions: First, what are the types of costs that must be identified and balanced in future environmental decisionmaking? . . . Second, what do we know about the magnitudes of these costs? Third, who pays these costs, and how? (p. 74)

### Damage, Avoidance, and Transaction Costs

- [D]amage [costs] occur when a pollutant is not stopped at its source or successfully avoided after it has been released. Damage costs include damage to health, to vegetation, and to materials; the costs of repairing such damages; the destruction of ecosystems; and the loss of aesthetic, recreational, and other environmental amenities. (p. 74)
- If a nearby lake becomes polluted, forcing people to drive farther to swim, the extra travel costs are avoidance costs. (p. 76)

- [W]e cannot arrive at any firm conclusions about the incidence of damage [or avoidance] costs. The poor are apparently exposed to somewhat more serious environmental degradation but are slightly less concerned about it. . . . [A]voidance costs . . . are borne mostly by the rich, though not necessarily in proportion to income. The rich can afford to pay these costs. The poor, having so many other basic unfulfilled needs, cannot. (p. 82)
- Transaction costs are often ignored in policy analysis. They are the costs of research, development, planning, monitoring, and enforcement needed to achieve environmental goals and standards. (p. 83)

## Abatement Costs

- It is clear that our national commitment to a cleaner environment will be very costly—about $275 billion during the next decade. It will total about 2.5 percent of our gross national product during this period. (p. 116)
- The private sector will bear nearly two-thirds of the total costs of pollution abatement over the next 10 years. (p. 100)
- [A]bout 55 percent of the total abatement costs expected during the coming decade is estimated to be in addition to expenditures that would have been undertaken in the absence of Federal initiatives. (p. 101)
- We have also estimated the aggregate effect on income distribution of the anticipated 1976 incremental [abatement] pollution control expenditures. . . . The aggregate impact of government financing is predominately progressive—i.e., the wealthy pay proportionally more than the poor. The aggregate impact of private financing is somewhat regressive—i.e., the poor pay a higher proportion of their income than the wealthy. Combining public and private financing shows that in total the net incidence of all incremental expenditures is slightly regressive. (p. 107)

## Making and Implementing Policies

- [In environmental policy] we seek continually to reduce damage and avoidance costs without generating greater increases in transaction and abatement costs. The goal is to identify that policy which minimizes the total of the four cost elements. (p. 109)
- The geographical distribution of [environmental] costs is clearly another important consideration. . . . Should the inhabitants of the Four Corners area be subjected to higher damage costs so that the residents of Los Angeles can have cheaper electricity and cleaner air? (p. 111)
- [U]nder current evaluation procedures . . . a decision to dam, to build, to cut, to fill . . . can [often] be supported even though such a decision may involve an irreversible commitment which is not in our best interests over the long run. (p. 111)
- In making decisions which result in an irreversible commitment of resources, it is necessary to analyze rigorously the availability of substitutes, the cumulative effects of many small irreversible commitments, and the future value to society of resource preservation. (p. 112)
- The problem of appropriate incentives pervades all environmental policymaking because the different types of costs are paid by different individuals. . . . Abatement costs are usually paid by the polluter. Damage costs and avoidance costs are usually paid by the public. Transaction costs are often paid by the regulating agency. Each will attempt to minimize his own costs, and the results may not lead to the lowest total costs to society. (p. 113)

## 4 The Law and Land Use Regulation

The fifth amendment to the U.S. Constitution provides that "private property" shall not "be taken for public use without just compensation." This chapter explores the implications of this "taking" clause as it applies to land use regulation by state and local governments to protect environmentally critical features of land. The chapter reviews the underlying values and historical antecedents of the taking clause and the traditional judicial theories for determining when compensation is required. It examines the application of these traditional theories to environmental regulation and concludes by describing recent judicial trends for dealing with the taking issue.

### The Pervasiveness of the Problem

- The taking issue is being raised in a variety of contexts across the Nation. (p. 123)
- The frequency with which the taking issue is being raised, however, is not a reliable indicator of the issue's potential as an obstacle to new or existing land use legislation. Experience suggests that many claims for compensation are denied by the courts. (p. 125)
- [T]he private property interests protected by the compensation clause occupy a firm place in American constitutional values. (p. 125)
- The search is for an accommodation that is equitable and fair to private landowners while fully protective of valid public interests, such as the interest in protecting the environment. (p. 126)

### The Traditional Approach to the Problem

- In the case of the taking clause of the fifth amendment, . . . history offers surprisingly little guidance. Indeed, what evidence there is suggests that the concern over Government regulation of land, as opposed to outright appropriation of title, is a relatively recent phenomenon dating from around the turn of the century. (p. 126)
- Instead of a single formula, at least four theories for deciding when a taking occurs emerge from the court opinions. . . . These four theories may be described as: the physical invasion theory, the nuisance abatement theory, the balancing theory, and the diminution of value theory. (p. 129)

### The Traditional Approach in the Environmental Context—Illustrative Controversies

- [T]he absence of a single theory to determine whether regulation amounts to a taking has led to a certain lack of uniformity among states in resolving the issue in essentially similar fact situations. (p. 134)
- A good example of recent judicial activity in the taking context is provided by the wetlands cases, testing the validity of regulations restricting an owner's right to fill or otherwise develop low-lying marsh or coastal lands. (p. 134)
- Some courts, in [wetlands] cases, have required compensation. . . . [Other courts], apparently employing a more flexible balancing test, have upheld similar wetland regulations despite their destruction of commercial value. (p. 134)

- [C]ourts have increasingly recognized the right of a town to restrict development to some extent in accord with the ability of the municipality to provide essential services. . . . [The cases] reveal an increasingly receptive . . . attitude toward the needs of government in dealing with the problems attendant on unplanned growth. (p. 138)
- In the courts, historic preservation has generally withstood challenges based on the taking clause. (p. 141)
- Courts are no longer interpreting the taking clause to mean that the elimination of commercial value by regulation must amount to a constitutional taking in all cases. (p. 142)
- [T]he constitutional authorization for land use controls cannot be taken by legislatures as an invitation to ignore the resulting burden on individual landowners. (p. 149)
- Increasingly, as new concepts of property have become more firmly established and recognition of the value of land as a scarce resource has mounted, the definition of reasonable use has changed. . . . This [new] approach provides equitable treatment for the interests involved—those of individual property owners and of society—based on the legitimate expectations of each. (p. 150)

## 5 Perspectives on Environmental Programs

This chapter discusses major developments in the past year in government programs to protect the environment. It seeks to put some of the many significant actions and program trends into perspective—where we stand and where we are going. In particular, this chapter seeks to analyze secondary or indirect ramifications—in terms of land use, energy, Federal-state relations, and other factors—of environmental controls.

### Air Quality

- [T]he Clean Air Act is having a number of important indirect or secondary impacts. They relate to land use and the distribution of growth, our auto-dominated urban transportation system and related life styles, energy supplies and policies, and the single largest industrial segment of our economy—the automobile industry. (p. 156)
- For 37 metropolitan areas of the United States that are especially hard hit by automotive pollution, State controls on stationary source emissions and Federal emission limits on new motor vehicles will not by themselves reduce total emissions sufficiently to meet the air quality standards for . . . [those] pollutants largely attributable to motor vehicle emissions . . . by the statutory 1975 deadline. The affected states were therefore required to include transportation controls in their plans for achieving national air quality standards. (p. 157)
- Land use and the distribution of economic growth will be affected by the Clean Air Act's provisions for controlling major new sources of air pollution. (p. 159)

- The problem is that domestic low sulfur fuel supplies are inadequate to meet the demand resulting from the $SO_x$ control approach of many state implementation plans. . . . To ensure that regions needing low sulfur fuel to meet primary standards receive priority and to minimize . . . adverse economic impacts . . . , the Administrator of EPA has formally encouraged the Governors to postpone low sulfur fuel requirements where they are not now needed to meet primary standards. (p. 162)
- [T]he debate that once centered on whether the auto emission standards could be met has now shifted largely to the issue of which technology for meeting these standards is most reliable and desirable. U.S. manufacturers are relying almost exclusively on catalyst-based systems. . . . Several foreign manufacturers have been developing alternatives. (p. 164)

### Water Quality—Extensive New Authority

- Enactment last October of the comprehensive Federal Water Pollution Control Act Amendments of 1972 culminated nearly 3 years of Executive and Congressional deliberations aimed at strengthening our clean water program. (p. 168)
- Perhaps the predominant influence on the law was the universal recognition that basing compliance and enforcement efforts on a case-by-case judgment of a particular facility's impacts on ambient water quality is both scientifically and administratively difficult. (p. 171)
- A major theme permeating the legislation is a strong role for the Federal Government. Implementation is to be carried out largely by the states, but most of their actions are subject to extensive Federal guidelines and backup enforcement authority. (p. 174)

### Hazardous Pollutants

- Under the [1972 Pesticide Control] Act, pesticide products may be classified for "general" or "restricted" use. A restricted use pesticide may be applied only by a certified pesticide applicator. . . . The Administrator of EPA is empowered to place whatever other constraints on restricted-use pesticides he deems necessary. (p. 183)
- The CEQ study on integrated pest management showed that often this approach provides better pest control at lower cost and with significantly fewer environment problems than reliance on chemical pesticides alone. (p. 186)

### Noise

- Noise was long accepted as a necessary though sometimes unpleasant part of living. Now it is regarded as a controllable pollutant which should be regulated. (p. 197)
- Noise emissions should be substantially reduced over time as Federal standards for new equipment take effect. But to be fully effective Federal standards must be complemented by state and local restrictions on the time and manner in which equipment is used. (p. 200)

### Solid Wastes

- Although there are Federal laws controlling release of hazardous materials to the air and water, there are no laws directly governing their disposal on or under the land. The unregulated disposal of hazardous wastes is a national problem. . . . [which] significantly threatens human health and other living organisms. (p. 201)

- A recent study released by the Council on Environmental Quality . . . concludes that technology is not a barrier to increased resource recovery from municipal wastes. (p. 202)
- Making 1,000 tons of steel reinforcing bars from scrap instead of from virgin ore takes 74 percent less energy and 51 percent less water, creates 86 percent less air pollution emissions, and generates 97 percent less mining wastes. (p. 204)
- A preliminary EPA survey shows that beverage container litter in Oregon has declined by 81 percent since the new law went into effect (p. 205)

### Energy

- There is no single or simple explanation for these [energy] shortages. Many unrelated factors interacted to shape the situation. (p. 207)
- This year's energy shortages resulted in large measure from insufficient oil refining capacity. . . . Now, with the termination of oil import quotas, oil companies have moved to expand refinery capacity. (p. 207)
- The President directed the Council on Environmental Quality, working with . . . other Federal agencies, to study the environmental impacts of oil and gas development on the Atlantic outer continental shelf and in the Gulf of Alaska. . . . Until this report is completed, no drilling will be permitted in either area. (p. 210)
- The Council has conducted a study of the potential environmental impacts of domestic deepwater ports to handle supertankers. . . . [D]evelopment of U.S. deepwater ports offshore appears environmentally preferable to transshipment in small vessels. (p. 211)

### Land Use

- Proposed Federal land use legislation, which would encourage states to protect critical areas and control large-scale development and growth, is still before the Congress. (p. 214)
- [P]ublic attitudes on development are showing a remarkable shift away from the historical American boosterism and toward a skepticism about the costs and benefits of unlimited growth. (p. 220)

### Protecting Our Natural Heritage

- This year could be the most active since 1964 for wilderness areas. . . . [T]he President and Congressional leaders have called for special efforts to identify and designate new wilderness areas in the East so that wilderness accessible to the Nation's large eastern population will be preserved. (p. 226)

### NEPA Developments

- The proposed new [NEPA] guidelines emphasize that environmental considerations should be taken into account from the beginning of the decisionmaking process. (p. 234)
- The revised guidelines explicitly require agencies to discuss the secondary environmental impacts of their actions, particularly on population concentration and growth. (p. 235)
- Many Federal programs and projects are . . . sounder environmentally because agency management knows that an adequate impact statement must be prepared and environmental factors given appropriate weight in decisions. (p. 246)

## 6 Environmental Status and Trends

This chapter provides information on status and trends in environmental quality—whether particular facets of environmental quality are improving or deteriorating and what current conditions are. Four major aspects of the environment are covered: air pollution, water pollution, land use, and population. It is not possible to give a simple summary of trends for the environment as a whole (or even for many particular environmental problems), but the Council is working toward a series of indices which would summarize significant aspects of environmental quality.

### Air Pollution

- 1971 and 1972 data for most air pollution monitoring sites show that the trend in air quality improvement noted last year has continued. (p. 271)
- Although there have been significant improvements in air quality, a massive effort is still needed to meet EPA standards. (p. 274)
- Transportation pollution, which consists predominantly of automobile emissions, showed a drop in HC (from 15.2 to 14.7 million tons) and CO (from 78.1 to 77.5 million tons). (p. 266)
- Of the 10 cities . . . 6 have shown a general trend toward improved levels of particulates and 7 have shown a similar improving trend for sulfur dioxide. (p. 272)
- The Mauna Loa solar radiation data illustrate not only the tremendous impact that natural events can have on environmental conditions but also the ability of the natural system to recover from temporary stresses. The carbon dioxide problem shows the impact that man's activities can have on natural systems. (p. 279)

### Water Pollution

- An analysis of the individual dischargers in Region IV shows not only that the major portion of the industrial water pollution problem is concentrated in a few industries but that it is concentrated in a few large plants. . . . One percent of all the facilities accounts for more than 50 percent of the total BOD discharged. (p. 280)
- Although the year-to-year trends [in the Detroit River] were somewhat mixed, the pollutant levels associated with industry were gradually lessening during the period, while municipal pollutant levels were generally worsening. (p. 285)
- When the population of the drainage basin of each [of the Great Lakes] is compared to the volume of the lake, one of the major reasons for the different degrees of pollution among the lakes becomes clear. . . . Lake Superior has a large volume of water to assimilate the wastes from a small population. In Lake Erie the situation is the opposite. (p. 289)
- Although pollution of certain estuaries and localized coastal waters has long been evident, more recently there has been concern that pollution of the oceans may be occurring on a regional, or even global, scale. (p. 293)

### Land Use

- In fact, urban uses accounted for only about 10 percent of the land within the SMSA's [standard metropolitan statistical areas] or about 1.3 percent of all land in the contiguous 48 States. (p. 297)

- The largest category of land within the metropolitan areas in 1970 was forest woodland. (p. 299)
- [A]lthough more and more people live in large urban areas . . . the population density within metropolitan areas is declining. (p. 302)
- In the Ocean County study area, several major high-density residential developments . . . consumed 14 percent of the wetlands area and affected a substantial additional area in the wetlands and shallow coastal waters before State legislation halted them in 1970. (p. 311)
- [T]he pressure of increased population on land resources has been a major factor leading to encroachment on floodplains. (p. 313)
- Many inhabitants of Ventura County have chosen the status of a hillside home over the greater safety of more suitable land. Substantial residential building has taken place on areas of steeply sloping soils subject to erosion, gullying, and landslides, while areas with soils more suitable for urban development have been left unused. (p. 315)
- Although no fully accurate data are available, it appears that total soil erosion losses have been sharply reduced in recent years. (p. 317)
- Especially in older cities, such as Baltimore, more flood damage incidents occur from inadequate drainage within the city than from rivers overflowing their banks. (p. 319)

### Population

- After leveling off in the 1968 to 1970 period, [the birth rate in the United States] has continued its sharp decline. (p. 321)
- At the current rate of growth, world population will double in less than 40 years. This will mean a staggering 4 billion additional people to feed, clothe, and shelter. (p. 323)

## 7 International Action to Protect the Environment

This chapter reviews international environmental accomplishments of the past year in a historical perspective. The first sections discuss protection of the oceans, control of transboundary pollution, and preservation of the world's wildlife and natural areas. Pollution control in 10 industrial nations and the international trade effects of pollution control are discussed next. The chapter concludes with a survey of international cooperation in solving the common environmental problems.

### Protecting the Oceans

- The oceans, in contrast to the land masses of our globe, are truly international. No nation exercises sovereignty over them, and no nation, acting alone, can protect them from pollution and other environmental insults. (p. 330)
- Approximately 1.5 million metric tons of oil enters the oceans from bilge pumping, tank cleaning, and ballast discharges each year, compared to 250,000 metric tons from vessel accidents. (p. 331)

- As early as 1962 the international community set an ultimate goal of eliminating all intentional discharges of oil into the oceans. . . . IMCO's Conference on Marine Pollution this October will be devoted to preparing a convention based on that goal. (p. 333)

- [A]s nations develop stronger controls on air and water pollution, there is a concern that wastes formerly discharged into the air and water might be dumped into the ocean. (p. 335)

- The U.N. General Assembly in 1970 called for a Law of the Sea Conference to stabilize international rules governing national rights in the ocean and, particularly, to establish a regime for mineral exploration and exploitation of the seabeds. . . . Substantive negotiations will begin in Santiago, Chile, in the spring of 1974. (p. 337)

### Transboundary Pollution

- Europe, which faces some of the most severe [transboundary] pollution problems, may be aptly compared with the industrialized Northeastern United States. (p. 337)

### Preserving the World's Natural Heritage

- From the time of Christ to 1800, roughly one species of mammal was exterminated each 55 years. Now the rate is over one per year. Nearly 60 percent of all recorded exterminations of mammals has occurred in the 20th century. (p. 341)

- The primary threat to many species of wild animals and plants is destruction of their natural habitat. The greatest danger to many others, however, is extermination caused by demands of international trade. This trade supplies animals for trophies and for skins—those of spotted cats and crocodiles, for example, and live animals for pets, public display, and medical research. (p. 344)

- Following the Stockholm Conference, the U.S. delegation to IWC, led by the Chairman of CEQ, urged the adoption of the 10-year moratorium on all whaling. Despite strenuous efforts by the United States, the Commission refused to agree to the moratorium or to open the meeting to the press. (p. 346)

### National Environmental Protection Programs

- A number of the world's industrial nations still lack comprehensive air and water pollution control laws and programs. . . . [In several nations] laws go beyond current U.S. authority. (p. 349)

### International Trade and Environmental Quality

- Japan, perhaps even more than the United States, will have to make sizable investments to deal with its environmental problems. In several major industrial categories, Japanese industries are already allocating a greater share of total investment to pollution control than are their U.S. industrial counterparts. (p. 358)

- [T]o the extent that the "polluter pays" principal is eroded by Government subsidy programs, the balance of trade is likely to be distorted. . . . Future developments in the international area need to be carefully watched to avoid trade distortions that in the long run will benefit no one. (p. 361)

**International Cooperation**

- [T]he leading example of extensive bilateral cooperation . . . is the Agreement on Cooperation in the Field of Environmental Protection Between the United States and the Union of Soviet Socialist Republics. Signed in Moscow in May 1972 by Presidents Nixon and Podgorny, implementation is now well along. (p. 365)
- [A] new U.N. Environmental Program (UNEP) . . . reports to the U.N. General Assembly through ECOSOC. UNEP will coordinate the activities of the specialized U.N. agencies, initiate action when it is needed, and create and implement a cohesive Action Plan for global environmental protection. (p. 368)

## 8 The Citizen's Role in Environmental Improvement

This chapter describes the environmental movement as it is constituted today—the variety of environmental organizations, their interests and activities, their resources, and their problems.

- Over the last 5 years, traditional conservation has broadened into the new environmentalism . . . [T]he range of issues of concern to citizens has expanded and new types of citizen organizations have appeared (p. 376)
- Many citizen organizations are learning not only to react to unwanted projects but to go a step beyond—to help in planning better alternatives. (p. 381)
- [I]t was the energy, enthusiasm, and even showmanship of students that gave Earth Day its unique flavor. (p. 381)
- [E]nvironmental groups . . . are involved in activities as diverse as taking handicapped children on camping trips, building vest pocket parks, monitoring noise pollution, and lobbying against billboards. (p. 388)
- [T]here are now about twice as many environmental organizations as before Earth Day. (p. 396)
- Statistics on numbers of members and size of budget do not give an accurate picture of the importance of environmental groups . . . Environmentalists share values and are willing to work hard to further them. It is this commitment, above all else, that provides the strength of the environmental movement. (p. 402)

# Contents

Page

**The President's Message** iii
**Letter of Transmittal** xi
**Highlights** xiii
**Preface** xxxiii
**1 The Urban Environment—Toward Livable Cities** 1
- Downtown—the City as the Center of Things 4
  - Design—the Structures Downtown 5
  - Space—the Setting of Downtown 13
  - Vitality—the Human Component Downtown 16
- Four Neighborhoods—the City as a Place to Live 20
  - The Historic Neighborhood 23
  - The Neighborhood with Special Charm—Renovation with Dislocation 26
  - The Stable Neighborhood—Preservation without Dislocation 29
  - The Renewal Neighborhood—Creating the Community 34
- Conclusions 39
- Footnotes 40

**2 Cleaning up the Willamette** 43
- The Setting 44
- Water Quality Restored 48
  - Pollution—the Early Days 48
  - The New Law 50
  - The First Plan 51
  - The Plan Reexamined 53
  - Further Tightening 54
  - Why Success? 55
  - Outlook for the Future 59
- Land along the River 60
  - Early Development 60
  - The Greenway Concept 62
  - The Greenway Plan 62
  - The Greenway—Recent Developments 64
  - The Greenway—Issues 66
  - Urban Areas 67
- Conclusion 69
- Footnotes 70

**3 Economics and Environmental Management** 73
- Damage, Avoidance, and Transaction Costs 74
  - Damage Costs 74
  - Avoidance Costs 76
  - Some Cost Estimates—Damage and Avoidance Costs 77
  - The Question of Incidence 80
  - Transaction Costs 83

## 3 Economics and Environmental Management—Continued

Page
Abatement Costs .......... 84
  Expenditure Trends—an Historical View .......... 86
    Public Sector .......... 86
    Private Sector .......... 87
  Estimates of Future Abatement Expenditures .......... 90
    Total Costs .......... 90
      Air Pollution .......... 95
      Water Pollution .......... 95
      Solid Waste .......... 96
      Noise .......... 97
      Radiation .......... 97
      Land Reclamation .......... 97
      Cumulative Costs .......... 98
    Incremental Costs .......... 100
  Financing Methods and Incidence .......... 101
    Public Sector .......... 101
    Private Sector .......... 104
  The Overall Impact of Pollution Abatement .......... 107
Making and Implementing Policies .......... 109
  Economics and Policy Evaluation .......... 109
  Limitations to Quantitative Decisionmaking .......... 110
    A Comment on Equity .......... 111
    Irreversibilities .......... 111
  Economics and Environmental Policy Implementation .......... 113
    The Problem of Incentives .......... 113
    Subsidies .......... 114
Summary .......... 116
Footnotes .......... 117

**4 The Law and Land Use Regulation** .......... 121

New Focus on Land Use—the Quiet Revolution .......... 121
  Pervasiveness of the Problem .......... 123
  The Basic Values to Be Balanced—Private Property and Public Environmental Concerns .......... 125
The Traditional Approach to the Problem .......... 126
  A Brief Historical Perspective .......... 126
  The Standard Judicial Approach—No Set Formula .......... 128
    The Physical Invasion Theory .......... 129
    The Nuisance Abatement Theory .......... 130
    The Balancing Theory .......... 131
    The Diminution of Value Theory .......... 132
The Traditional Approach in the Environmental Context—Illustrative Controversies .......... 134
  Prohibiting Land Fill—the Wetlands Cases .......... 134
  Regulating Growth and Development .......... 137
  Preserving the Quality of the Human Environment .......... 140
    Open Space Preservation .......... 140
    Landmark Preservation .......... 141
Recent Judicial Trends—the Response to New Environmental Concerns .......... 142
  The Traditional Approach Revisited .......... 142
  The Declining Importance of Economic Loss as a Test for Taking .......... 143
    The Undermining of the Diminution of Value Theory .......... 143
    The Nuisance Abatement Theory .......... 144
    The Critical Natural Features Theory .......... 146
    The Moratorium Theory .......... 147
Summary and Conclusions .......... 148
  The Role of the Legislature .......... 148
  Evolving Concepts of Property .......... 149
Footnotes .......... 150

Page

**5 Perspectives on Environmental Quality** 155

Air Quality—Emerging Effects of the Clean Air Act 155
  Urban Transportation 157
  Land Use and Growth 159
  Energy 161
  Autos and the Economy 163
  Standards and Monitoring 166
  Summary 167

Water Quality—Extensive New Authorities 168
  Summary of P.L. 92-500 169
  Factors That Shaped the Law 171
  A Stronger Federal Role 174
    Permits 174
    Federal Standards and Enforcement 175
  A Strategy for Implementation 176
  Citizen Participation 176
  Lake Eutrophication 177
  Protecting the Oceans 178
  Safe Drinking Water 180
  Summary 181

Hazardous Pollutants 182
  Pesticides 183
    A New Pesticide Law 183
    Implementation of the Law 184
    Regulatory Actions 184
    Field Reentry Standards 185
    Integrated Pest Management 186
  Toxic Substances 187
    Pending Legislation 187
    PCB's 188
    Haloethers 189
  Radiation 189
    Exposure Standards 190
    Discharges from Nuclear Powerplants 191
    Emergency Core Cooling Systems 193
    Nuclear Fuel Cycle 194
    Medical Exposure 195

Noise 195
  Transportation Noise 197
  Noise from Other Products 199

Solid Wastes 200
  Hazardous Wastes 201
  Resource Recovery 202
  Solid Waste Management 204

Energy 205
  Energy Supply—the Past Year 206
  New Energy Initiatives and Environmental Safeguards 208
    Increased Supplies of Natural Gas 209
    Use of Coal 209
    OCS Leasing 210
    Oil Imports 210
    Powerplant Siting 211
    New Energy Sources 211
    Energy Conservation 212
    June Energy Statement 213

Land Use 214
  Proposed Federal Legislation 214
  State and Local Action 215
    Comprehensive State Land Use Laws 215
    Protection of Coastal Zones and Other Critical Areas 216
    The Recreational Land Sales Boom 219
    Limits on Growth 220

## 5 Perspectives on Environmental Quality—Continued

Page

- Protecting Our Natural Heritage ..... 222
  - Protection of Wildlife ..... 223
    - Endangered Species ..... 223
    - Marine Mammals ..... 224
    - Predator Control ..... 225
  - Protecting Wilderness and Other Important Lands ..... 225
    - Wilderness Areas ..... 225
    - Wild and Scenic Rivers ..... 227
    - Areas of Special Concern ..... 228
      - Alaska Pipeline ..... 228
      - Big Cypress ..... 230
      - Great Dismal Swamp ..... 231
    - Parks ..... 232
- NEPA Developments ..... 234
  - Revised CEQ Guidelines for Impact Statements ..... 234
  - Developments in the Courts ..... 236
    - Substantive Review under NEPA ..... 237
    - The Supreme Court and *SCRAP* ..... 239
    - Technology Assessment and NEPA ..... 241
  - Administrative Developments ..... 242
    - Filing Patterns of Impact Statements ..... 242
    - Quality of Impact Statements ..... 245
  - NEPA and Decisionmaking ..... 246
  - State NEPA's ..... 248
- Conclusion ..... 248
  - Secondary Effects ..... 249
  - Institutions ..... 249
  - Technological Developments ..... 249
  - The Role of the Courts ..... 250
  - Citizen Support ..... 251
- Footnotes ..... 251

**6 Environmental Status and Trends** ..... 263

- Use of Environmental Indices ..... 263
- Air Pollution ..... 265
  - Air Pollution Emissions ..... 265
  - Ambient Air Quality ..... 271
  - Air Quality Indices ..... 275
  - Global Trends ..... 277
- Water Pollution ..... 279
  - Water Pollution Effluents ..... 280
  - Water Quality ..... 283
    - National Stream Quality Accounting Network ..... 283
    - EPA Studies of Water Status and Trends ..... 284
  - Pollution in the Great Lakes ..... 287
  - Other Efforts to Define Water Pollution Status and Trends ..... 292
    - EPA Eutrophication Study ..... 292
    - Water Quality Index ..... 293
    - Refinement of Enviro Control Study ..... 293
    - Ocean Pollution ..... 293
- Land Use ..... 295
  - National Trends in Land Use ..... 297
  - Land Availability ..... 305
    - Agricultural Land ..... 306
    - Open Space and Parks ..... 308
  - Areas of Critical Environmental Concern ..... 310
    - Wetlands ..... 311
    - Development on Flood Plains ..... 312
    - Development on Unsuitable Soils ..... 314
  - Land Use Effects ..... 316
    - Erosion ..... 316
    - Surface Mining ..... 318
    - Impervious Surfaces ..... 318
  - Land Use Indicators ..... 320
- Population ..... 321
- Summary ..... 323
- Footnotes ..... 325

Page

**7 International Action to Protect the Environment** 329
- Protecting the Oceans 330
  - Oil Pollution 330
    - Early Oil Pollution Controls 331
    - The 1954 Convention 332
    - Efforts since 1954 332
    - The 1973 IMCO Conference 333
  - Ocean Dumping 335
  - Domestic Air and Water Pollution 336
  - Law of the Sea Conference 337
- Transboundary Pollution 337
  - The United States and Canada 338
  - Controlling Salinity in the Colorado River 339
  - European Problems 340
- Preserving the World's Natural Heritage 340
  - Early Efforts 341
  - The 20th Century 342
    - Endangered Species Convention 343
    - Whales 344
  - Areas of Unique Value 347
- National Environmental Protection Programs 348
- International Trade and Environmental Quality 349
  - Comparative Environmental Standards 357
  - Comparative Costs of Environmental Controls 357
  - Subsidies 358
  - Impacts of Standards on Trade 361
- International Cooperation 362
  - Early Scientific Cooperation 362
  - Regional Efforts 362
    - CCMS 363
    - OECD 363
    - Other Regional Groups 364
  - Bilateral Cooperation 365
  - Worldwide Cooperation 367
    - The United Nations 367
    - Earthwatch Program 369
- Conclusion 370
- Footnotes 371

**8 The Citizen's Role in Environmental Improvement** 373
- The Development of Environmentalism 373
  - The Philosophical Foundation 374
  - Hetch-Hetchy 374
  - Developing New Arguments 375
  - Discovering New Tools 375
- The New Environmentalism 376
- Types of Environmental Organizations 380
  - Community Organizations 380
  - Youth Groups 381
  - State Coordinating Councils 384
  - Regional Service Centers 386
  - National Organizations 386
- Activities 388
  - Information Dissemination 339
  - Political Action 390
  - Recycling 392
  - Legal Action 393
  - Land Purchase 396
- The Environmental Movement—Resources and Problems 396
  - Membership 396
  - Income 398
  - Commitment 402
- Summary 402
- Footnotes 404

**Photo Credits** 480

**Index** 483

**Appendices**

Page

A Organization and Staff of the Council on Environmental Quality . . 405

B The National Environmental Policy Act of 1969, January 1, 1970 . . . . 408

C The Environmental Quality Improvement Act of 1970, April 3, 1970 . . . . 413

D Preparation of Environmental Impact Statements: Guidelines . . . 416

E The President's State of the Union Message on Natural Resources and the Environment, February 15, 1973 . . . . 440

F The President's Energy Message, April 18, 1973 . . . . 448

G Federal Environmental Program Budgets . . . . 463

H Advisory Committees of the Council on Environmental Quality . . 476

**Tables**

**Chapter 3**

1 Estimated National Air Pollution Damage Costs for 1968 . . . . . . . 78

2 Estimated National Air Pollution Damage Costs with No Pollution Control 1968 and 1977 . . . . 78

3 Distribution of Water Pollution Costs, Selected Local Studies . . . 79

4 1972 Federal Transaction Costs . . . . 83

5 Estimated Total Pollution Control Expenditures . . . . 93

6 Estimated Incremental Pollution Control Expenditures . . . . 99

7 Government Subsidies for Private Pollution Control Facilities by State, May 1973 . . . . 106

8 Estimated Cost Effects of the Clean Air Act for Fiscal Year 1977 . . 110

**Chapter 5**

1 Estimated Average Annual Whole-Body Exposure of the General U.S. Population to Ionizing Radiation for 1970 . . . . 191

**Chapter 6**

1 Estimated Emissions of Air Pollutants, by Weight Nationwide 1971 . . . . 266

2 Air Quality Data for Selected Cities, Ratio of Annual Mean to EPA Primary Standards . . . . 273

3 Number of Air Quality Control Regions by Priority Ranking for Major Pollutants 1971 . . . . 274

4 Industrial Effluents, EPA Region IV . . . . 281

5 Measures of Concentration of Population in the United States for 1950–1970 . . . . 303

6 Development by Class of Soil, Montgomery County, Md. . . . . . . 315

*Appendix*—Percentage of 1971 Total Air Pollution Emissions, by Source and by Pollutant, Unadjusted and Adjusted for Effects . . . . . 328

**Chapter 7**

1 Highlights of National Pollution Control Programs in 10 Industrial Nations . . . . 350

2 Estimated Incremental Pollution Control Expenditures as a Percentage of Gross Domestic Product 1971–1980 . . . . 358

3 Pollution Control Investment for Japan and the United States . . 359

4 Depreciation Allowances for Pollution Control Equipment in Selected Countries . . . . 360

**Figures**

**Chapter 2**

1 The Willamette Basin . . . . 45

2 Man's Settlements along the Willamette . . . . 46

3 Precipitation and Flow at Salem . . . . 47

4 Dissolved Oxygen and Bacteria, 1929 . . . . 49

5 Reduction in Oxygen-Demanding Wastes, 1957–1972 . . . . 55

6 Dissolved Oxygen Levels, Low-Flow Months, Lower Willamette River . . . . 56

**Chapter 3**

Page
1 Incidence of Air Pollution in Three Cities 81
2 Environmental Concern by Income Level 82
3 State and Local Investment for Waste Water Collection and Treatment Facilities for 1958–1971 87
4 Per Capita State and Local Investment for Waste Water Collection and Treatment Facilities for 1958–1971 88
5 State and Municipal Expenditures for Environmental Purposes 1958–1971 89
6 Federal Pollution Abatement Outlays for Fiscal Years 1969–1973 and Estimated Fiscal Year 1974 90
7 Industrial Pollution Control Investment for 1967–1972 and Estimated 1973 91
8 Total Plant and Equipment Investment and Total Pollution Control Investment for 1967–1972 and Estimated 1973 92
9 Operating and Maintenance Costs and Capital Charges for Pollution Abatement Facilities as a Percentage of Total Costs for 1972–1981 94
10 Distribution of Total Environmental Expenditures 1972–1981 98
11 Estimated Cumulative Baseline and Incremental Control Expenditures for 1972–1981 100
12 Distribution of Cumulative Incremental Environmental Expenditures 1972–1981 102
13 Relative Incidence of a $1 Billion Tax Increase as a Percentage of Family Income 103
14 Incidence of a $1 Billion Service Charge as a Percentage of Family Income for Waste Water 104
15 Incidence of Estimated Price Increases as a Percentage of Family Income for Automobiles and Electricity 1976 105
16 Incidence of Incremental Pollution Abatement Costs as a Percentage of Family Income 1976 108
17 Federal Grants for Municipal Water Pollution Control and Total Capital Expenditures by Municipalities for Fiscal Years 1956–1972 and Estimated Fiscal Years 1972–1974 115

**Chapter 4**

1 Town of Dedham, Mass., 1971 136

**Chapter 5**

1 Three Systems Designed to Meet Stringent Automotive Emission Standards 165
2 Land and Water Conservation Fund Outlays for Fiscal Years 1965–1972 and Estimated Fiscal Years 1973 and 1974 233
3 Environmental Impact Statements Filed with the Council on Environmental Quality for 1970, 1971, 1972, and 1973 (by Type of Action) 243
4 Environmental Impact Statements Filed with the Council on Environmental Quality for 1970, 1971, 1972, and 1973 (by Agency) 244

**Chapter 6**

1 Emissions of Hydrocarbons by Automobiles in Urban Areas 268
2 Emissions of Carbon Monoxide by Automobiles in Urban Areas 268
3 Emissions of Particulates in Philadelphia 1962–1971 269
4 Emissions of Sulfur Dioxide in Philadelphia 1962–1971 269
5 1971 Air Pollution Emissions, Percentage by Pollutant, Unadjusted and Adjusted for Effects 270
6 1971 Air Pollution Emissions, Percentage by Source, Unadjusted and Adjusted for Effects 270
7 Trends in Ambient Levels of TSP and $SO_2$ 272
8 Increase in Carbon Dioxide Concentrations at Mauna Loa Observatory 278
9 Transmittal of Normal Incidence Solar Radiation at Mauna Loa 279
10 Number of Facilities by Amount of BOD Discharged, EPA Region IV 282

**Chapter 6—Continued** Page

11 Detroit River, Annual Means for Coliforms, Chlorides, and Phenols . . . . 286
12 Characteristics of the Great Lakes . . . . 287
13 Changes in Total Dissolved Solids in the Great Lakes . . . . 288
14 Commercial Production of Lake Trout and Whitefish in the Upper Great Lakes . . . . 290
15 Standard Metropolitan Statistical Areas . . . . 298
16 Land Use within SMSA's 1970 for the 48 Contiguous States . . . . 299
17 Boston, Built-Up Land Use 1970 . . . . 300
18 Boston, Forest Land Use 1970 . . . . 300
19 The Baltimore-Washington Megalopolis . . . . 301
20 Composite Population Density Curves . . . . 304
21 Washington, D.C., Metropolitan Area Population Density, 1970. 305
22 Washington, D.C., Metropolitan Area Estimated Median Family Income, 1970 . . . . 306
23 Land Use by Distance from the City Center: Denver . . . . 307
24 Parks and Recreation Land Use vs. Density: Denver, Kansas City, and Riverside . . . . 309
25 Development in New Jersey Wetlands . . . . 312
26 Mined Land Inventory Map, Pike, Warrick, and Gibson Counties, Ind. . . . . 319
27 Total Fertility Rate, 5-Year Averages 1920–1959 and Single-Year Data 1960–1972 . . . . 322
28 Projection of Total Population, 1972–2020 . . . . 323

**Chapter 7**

1 Annual Growth of Oil Transport by Sea . . . . 331
2 Ambient Air Quality Standards for Sulfur Dioxide in Selected Countries . . . . 356

**Chapter 8**

1 Major Activities of Environmental Groups . . . . 387
2 Primary Source of Operating Funds of Recycling Groups . . . . 394
3 Size of Environmental Groups . . . . 397
4 Primary Source of Operating Funds of Environmental Groups . . 399
5 Annual Budgets of Environmental Groups . . . . 400
6 Primary Source of Operating Funds of Educational Groups . . . . 401

# Preface

The Fourth Annual Report of the Council on Environmental Quality was prepared in accordance with the National Environmental Policy Act of 1969, Public Law 91–190, 42 U.S.C. 4321, which requires the Council to report at least once a year on the state of the environment and efforts to improve it.

The Council welcomes comments on this report, especially suggestions for activities at the state and local levels of government and in the private sector. We would also appreciate comments on the report's presentation, including the appendices, footnote references, graphic material, and the like.

Although this report is the product of long and concerted efforts by the Council's staff and members and reflects excellent cooperation from a number of Federal agencies, a number of individuals both inside and outside the Government deserve special gratitude and acknowledgment for their assistance. Special appreciation is due to: Lyndon R. Babcock, Jr., of the University of Illinois; Alfred Beeton, of the University of Wisconsin; Fred P. Bosselman, Esq., Chicago; Kessler Cannon, of the Office of the Governor of Oregon; George Churchill, of the Oregon Highway Department; William Cox, William Hunt, Frederick Leutner, Robert E. Nelligan, and Herbert Simeson, of the Environmental Protection Agency; Leonard Crook, of the Great Lakes Basin Commission; James C. Huetter, of the Army Corps of Engineers; Philip Johnson and Laurence Tombaugh, of the National Science Foundation; Lester Machta and Donald Pack, of the National Oceanic and Atmospheric Administration; Robert C. Otte, of the U.S. Department of Agriculture; Kenneth Spies, of the Oregon Department of Environmental Protection; Jack Pickering, Timothy Steele, and James R. Wray, of the U.S. Geological Survey; and Jack Waugh, Santa Fe.

## CHAPTER 1

# The Urban Environment—Toward Livable Cities

This is a chapter about America's cities and the kind of environment they can offer to those who visit or work or live in them. It attempts to identify those factors which make a city seem to come alive, to attract people—simply to work as a city. Increasingly, there are signs that real and workable alternatives to the continued decay and decomposition of our cities exist. There are places in some of our cities where people and things are coming together, where vitality persists or has reappeared, and where citizens have successfully checked attempts to repeat the mistakes of the past. Without promising any formulas for a renaissance of American cities, this chapter seeks to identify and bring together in one place some of the approaches, projects, and techniques which have brought a measure of visible improvement to the environment of our cities. Through this effort, we hope to render a useful service and to serve as a source of information for citizens seeking new ways to approach the problems of their cities.

Two years ago, the Council published as part of its Second Annual Report a chapter on the inner city environment. It was one of the earliest analyses of how traditional issues of environmental quality relate to the problems of the urban poor. The chapter discussed those aspects of air pollution, water pollution, solid waste, neighborhood deterioration, open space needs, and transportation policies that impact especially on the disadvantaged. Much of what was said in that chapter remains true, despite the continued efforts of public authorities and private citizen groups to give special attention to the environment of the inner city.

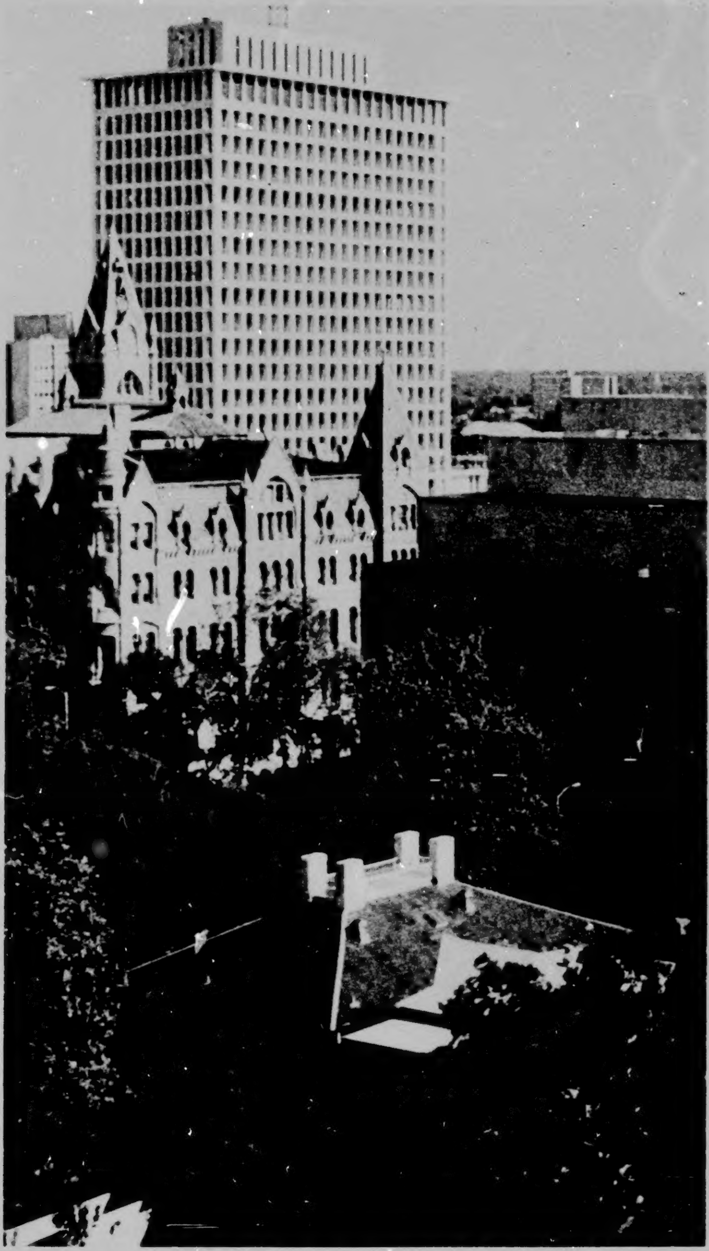
This year the Annual Report looks beyond the inner city to the whole urban environment. Our purpose is to try to define the quality of life that a city can offer its residents—to look at what makes a city come alive as a dynamic place to be. This calls for close analysis of the basic elements of design, space, and vitality that make a downtown a place where people want to go or a neighborhood a place people want to go home to.

Such a focus on our cities requires that we bypass other approaches which may add to a fuller understanding of where our cities are heading. Thus, although the discussion which follows identifies some of the important economic and social ills facing our cities, it does not attempt to analyze them in depth and articulate the policies to resolve them. Nor does this chapter directly discuss the more traditional environmental issues of air and water pollution or solid waste management in our cities, although many data in other chapters derive from urban areas. Finally, we focus on the central cities—the downtown areas and urban neighborhoods which have not shared in the growth of suburbia but which are beginning in some areas to attract again the interest and involvement of a broad spectrum of urban residents.

We recognize that this approach will not satisfy some readers. Those who believe that the suburbs can supply all urban living needs will disagree with us. Those seeking broad and detailed public policy solutions to the problems of our cities will be disappointed. There are some who believe that only the wholesale demolition and reconstruction of existing urban areas will save the cities. There are others who have already written the cities off as leftovers from another era and who believe that whole new communities need to be built elsewhere to meet the demands of urban life today. We do not address ourselves to either of these massive-scale solutions to the problems of our cities because neither seems very realistic.

The fact is that most of our cities will not be torn down or completely rebuilt in our lifetime. Even in a city as active in renewal as Pittsburgh, less than 2,000 acres has been renewed out of 14,000 in officially designated renewal areas—after 25 years. Although public and private redevelopment is occurring throughout the city, not a single renewal project has been completed. At this rate, it will take 150 more years and substantial amounts of money and other resources to remake Pittsburgh within these renewal areas alone. By then, of course, the process would have to begin again, renewing what would then be structures 150 or more years old.[1]

So even as the suburbs continue to build outward and more industries locate on the outskirts, Americans are beginning to accept the fact that the basic design and layout of our cities is going to be with us much as it is for the foreseeable future. Once we realize this, the question then becomes how to make our cities better places to live, work, and spend leisure time.



New and old, large and small, the buildings of Richmond show how diversity can make a city an attractive place to be.

In short, despite the arguments of those who call for drastic solutions to the problems of American cities—from total renewal to total abandonment—we say that there is a better way to look at them without predicting utter despair or complete utopia. That way is to recognize and build upon the tremendous physical resources already in our cities, to blend the old and the new in a way that preserves the character and personality of our cities and uses the elements unique to each of them as guides for progress and change.

## Downtown—the City as the Center of Things

The most obvious characteristic of downtown in American cities is its increasingly uniform appearance from coast to coast. Imagine being placed blindfolded in the commercial center of many of our cities—Newark, Kansas City, Dallas, Denver, and San Diego, for example—having the blindfold removed, and trying to identify where you are. A look at the buildings, the spaces, and the life around you would lend few clues. The best way to identify where you are would be to look at the strips of the outside world filtering through the cracks between the buildings. The mountains, the rivers, the bays, the distant open spaces would tell you. Otherwise you would not know.

Downtown Dallas shows little to distinguish it from Denver or Kansas City or any number of other cities across the country.

There are exceptions which come to mind, of course—cities like New York, Boston, San Francisco, or New Orleans, which still have their unique urban character. But too often downtown is a dull uniformity of large office buildings, extensive parking lots and garages, and deserted streets after 6:00 p.m. Design seems to have been left to each property owner to maximize his profit, and the city's main concern appears to be its property tax bite. Space has been gobbled up by the demands of the automobile, and older buildings have come tumbling down when their owners conclude that they are worth less than the daily parking charges for the ground beneath them. And vitality has been drained by suburban life styles and by the relocation or disappearance of the things that once brought people downtown after dark and on weekends.

Some cities have fought these forces with varying amounts of success. Others have given in to them and have long since abandoned any hope or desire to restore downtown as the center of things in the city. But there is evidence in more and more cities that this is not inevitable and that things can be done to assure a viable downtown. Some cities have found ways of holding onto the activity centered there; others have actually brought back vitality that had been lost. It is worthwhile to look at how some have done it.

## Design—the Structures Downtown

Many American downtowns suffer from problems of bulk and scale. New multistory structures lacking in amenities on a human scale have thrown the downtown area out of balance for the pedestrian or the shopper or the businessman out on an errand. The economics and risks of downtown construction are such that large multistory structures or complexes have become the order of the day. Sometimes these work, as with Philadelphia's Penn Center and the Government Center in Boston. In other places, they blend unobtrusively into the already massive scale of downtown, as in New York or Chicago. But in some cases, downtown areas have suffered from too much high-rise construction which has sapped their vitality and resiliency over time.

Some of the downtowns of American cities are dominated by one species—the high-rise commercial structure. Some high-rise buildings may be important to help make the overall downtown area thrive, but they need to be kept in balance. High-rise commercial structures, for example, increase the value of nearby land for parking lots and other auto-related uses. This often means the loss of the smaller, older structures which previously set off the taller buildings and made them visually acceptable as part of the continuous urban pattern. It results in the "bombed out" look that characterizes many downtowns. In some Western cities, up to two-thirds of the center city land area is now devoted to automobile-related uses.[2] In other cities, e.g., Atlanta and Minneapolis, the downtown commercial core has developed into a strip little more than a block wide surround by acres of parking lots, creating an environment hostile to pedestrians a few steps off Peachtree Street or Nicollet Mall. Barring a system of mass transit, this could be relieved at least in part by encouraging parking structures with shops rather than parking lots at street level.

In a number of cases, the pattern of alternating high rise and parking lots has been exacerbated by urban renewal programs which cleared large areas of land without any economically solid plans to reuse it—and could find no takers. In other cases, the renewal authorities have recognized the need to keep and rehabilitate smaller buildings and shops. Without them as part of the renewal effort, it is hard to assure continuity and variety in the urban scene after the larger buildings are built.

Large-scale high-rise commercial buildings have come under recent criticism on other counts. The extensive open areas around them and their tendency to be deserted after 6 p.m. provide optimum conditions for criminal activity and encourage people to depart the downtown area quickly after the end of the working day.

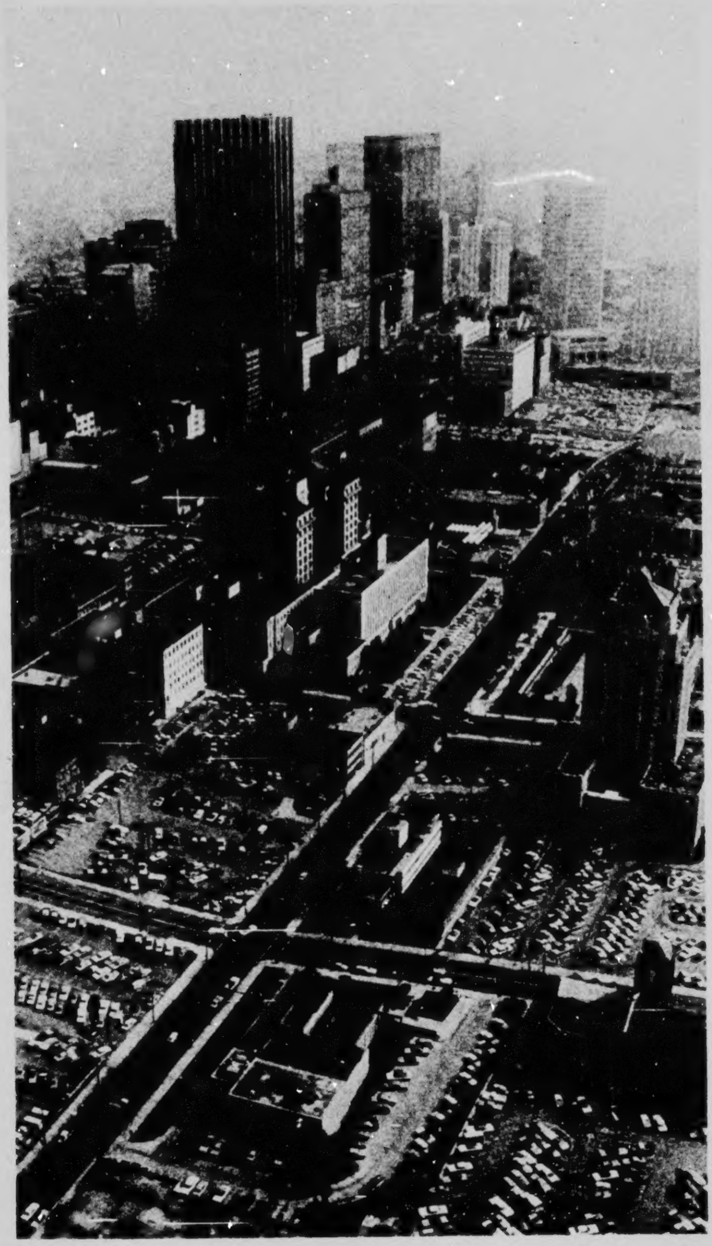
Another interesting problem is wind velocities. Recent studies in San Francisco have shown that high-rise structures interrupt high velocity wind currents at their rooflines and set up eddies which substantially increase wind speeds at ground level.[3] This makes it difficult to have outdoor restaurants, cafes, art exhibits, and other activities that add to a sense of vitality in the city.

The key that many cities have found to making a better urban environment downtown lies in the diversity and mix of activities and surroundings found there. As one commentator put it,

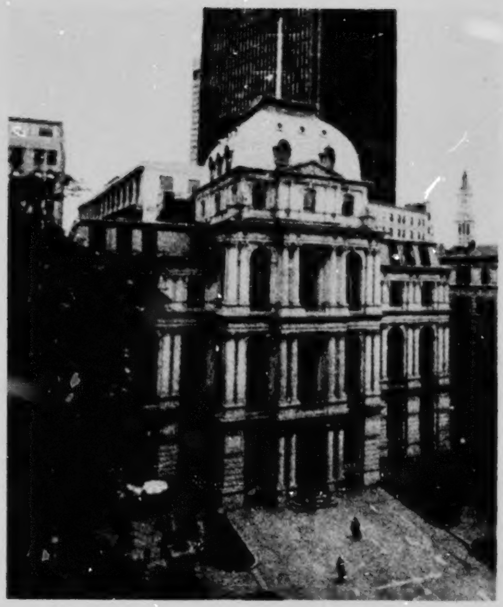
> The cherished miscellany of a town that has just grown celebrates the reality of life. It includes overcrowding, clutter and variety; it includes nonsense and extravagance; it includes commercial excrescence and real artifacts; it includes the genuine works of the country and trash made for tourists; it includes things people need and things they do not need but want. It is, like real life, like bread *and* like circuses.[4]

There is an analogy here to the natural science of ecology, in which it is said that a mature community is one that is stable but that has within it ongoing changes and adjustments. Cities, like other communities, *must* have this dynamic activity to remain stable. Thus, we cannot freeze our downtowns as they are now and hope that over time they will become quaint and historic places to return to with nostalgia. Change and growth are needed to keep cities alive. But the change need not be at the expense of diversity.

There are many fine examples of new buildings which blend into our cities in a way that enhances their vitality and attraction. Some are giant structures in the midst of other giants, such as the new office building at 77 Water Street in Manhattan, which finds its place



The land use pattern of downtown in American cities—high rise surrounded by parking lots—is depicted in this view of Atlanta.



Old City Hall in Boston was purchased by private investors and converted into prestige office space.

unobtrusively among other towers and gives over its ground space to a mix of human activity centering around benches, cafes, and trees. Others have begun with older structures sitting in the shadows of new high rises and made them over into prime, modern office space of a different scale within surroundings of a different era. A good example is the Old City Hall in Boston, which is now fully modernized in a way that enhances its Second Empire elegance and makes it a prestige address for businesses. Still others have accommodated old and new side by side, as in the case of the New York Bar Center in Albany and the restoration, with a major new addition, of the 1810 Park-Danforth Home for the Elderly in Portland, Maine.

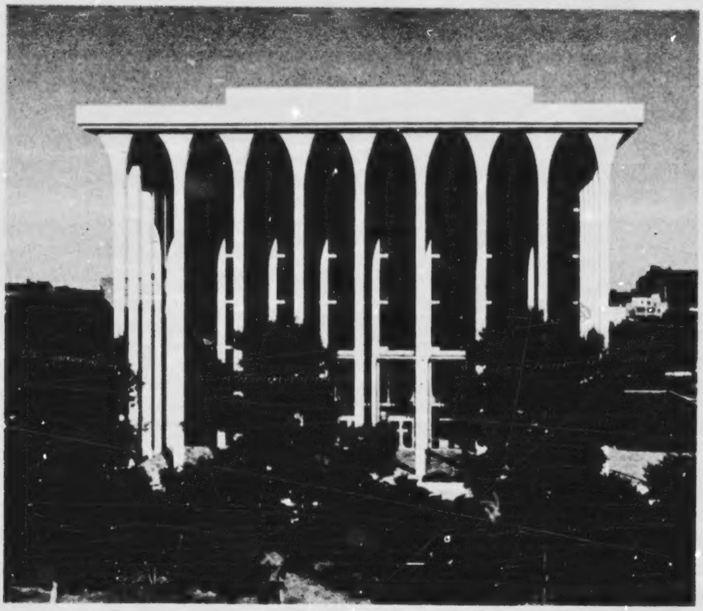
The downtown areas of American cities that work as places to attract people are those that have kept and enhanced with new construction the mix of uses and mix of scales that have long marked the character of the city and given it its unique flavor. Sometimes, as in Boston, the buildings themselves generate the excitement. Or it might be the terrain that does it, as in San Francisco, although even there new high-rise construction has visually leveled the hills. Other cities have found the key by tying downtown development to the historic base of the city, as in Cincinnati with its waterfront renewal and in Philadelphia with its restoration of the old merchants' residences on Society Hill.

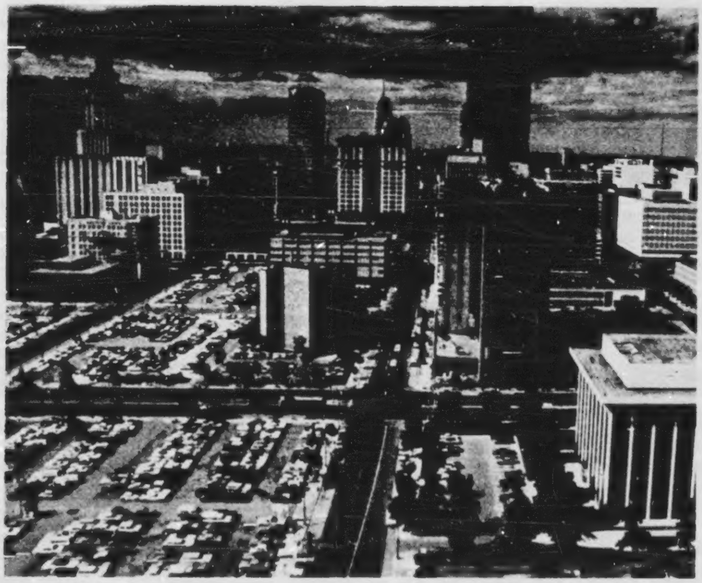
Sometimes this is difficult because the new buildings are designed as showpieces to stand alone. The Northwestern National Life Insurance Company building in Minneapolis is a beautiful architectural achievement often captured by the photographers' lens, but its environment is a sea of parking lots leading off to an abandoned riverfront.

New construction is often encouraged by local governments because large high-rise buildings bring in tax revenues, although there is evidence that the demand for services and public facilities generated by such buildings can often offset the benefits with increased costs to the city.[5] Other incentives are provided by federal tax laws, which encourage demolition and new construction over rehabilitation of existing structures. In his 1972 and 1973 Environmental Messages, the President has proposed amendments to remove this bias in the Internal Revenue Code against older buildings.[6]

Other difficulties relate to adaptive use—fitting modern needs into older structures. But these too can be overcome by thoughtful design. The Actors Theatre of Louisville uses a restored Greek Revival bank building registered as a National Landmark and dating from 1837 as its theatre lobby. Because the bank was not large enough for the theatre itself, ATL purchased an adjoining office building, then built the theatre behind both. To acquire the bank, the group built a new building for the owners a few blocks away, then traded it.

There are many other fine examples, too many to mention here, of older buildings which have been saved, not as museums or artifacts of another era but as active and economically viable structures lend-



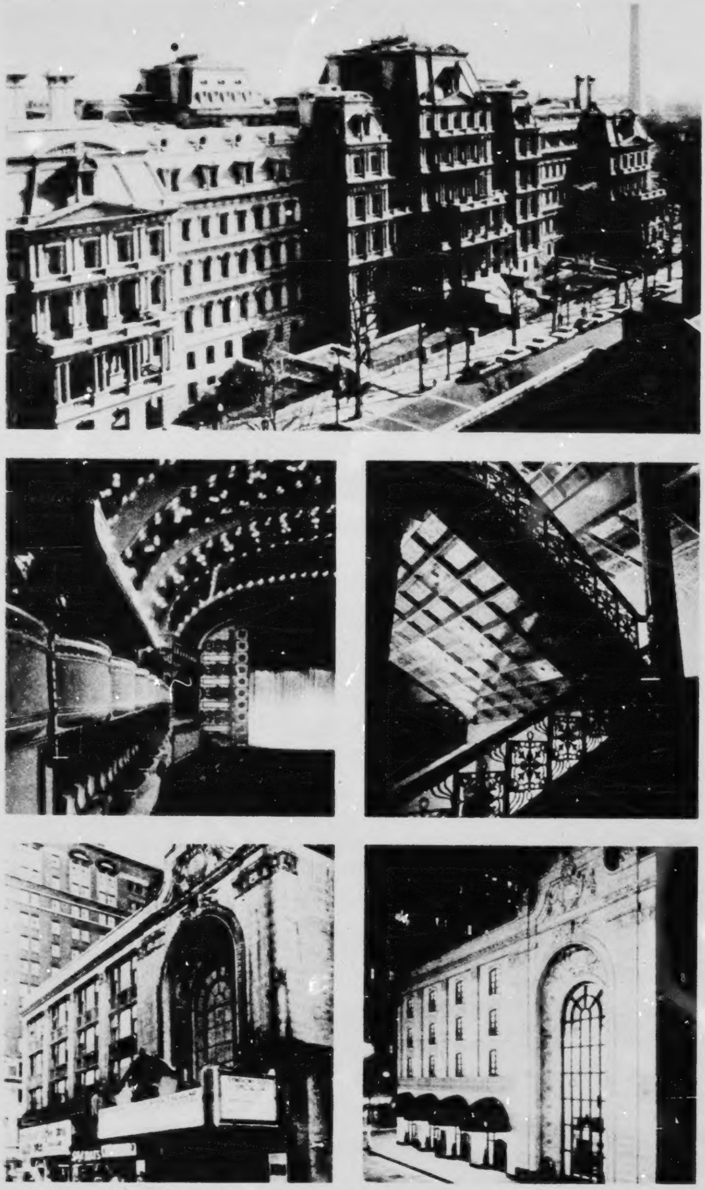


The Northwestern National Life Insurance Company building in Minneapolis shows that even prize-winning architecture does not make a city attractive if buildings do not relate to each other.

ing a variety of architectural style to their downtown areas.[7] An obvious example in the Nation's capital is the Old Executive Office Building on the corner of 17th Street and Pennsylvania Avenue; once slated for demolition, the refurbished building is now praised by tourists and occupants alike. The Cumberland Hill School in Dallas, the oldest school building in the city, was restored to its original Victorian style and serves as the downtown office of an oil drilling firm, whose president had long admired the structure and was seeking something unusual for a headquarters. The Auditorium Theatre in Chicago has been restored to its original elegance as an Adler and Sullivan architectural masterpiece, after many years of neglect and abuse. Denver's Larimer Square, the only block of older buildings in the area saved from urban renewal clearance, has become the center of night life downtown, with its cafes and shops that capture the early days of the city. In Pittsburgh, an old movie palace has become Heinz Hall for the Performing Arts. Private developers in Indianapolis have purchased the old Union Station and plan to convert it into a "Gay '90's" arcade of shops and cafes.

Similar plans are well advanced for converting the Old Post Office in St. Louis into a multipurpose facility with hotel, shops, offices, and an arcade. This effort has required a high level of cooperation among local authorities, private redevelopers, and the Federal Government. As part of his 1971 Environmental Message, the President proposed, and the Congress later enacted, legislation amending the Surplus Property Act so that the Old Post Office and buildings like it could be turned over to cities for active commercial use.[8] The Small Business Administration has also assisted by floating loans for smaller shopowners to pay the cost of preparing space in the rejuvenated building.

Markets have provided another focus for reinvigorating downtown. In many cities, the old open markets with stalls of fruits and vegetables have all but disappeared. Now many cities are trying to bring them back and turn them into places people are attracted to from all over town. The Pike Place Market in Seattle is a good example. Once again, an overambitious urban renewal program spurred local citizens to action. The original plan was to keep only a 1.7-acre portion of the market area and surround it with a 4,000-car garage, a 600-room convention hotel, and other construction on a massive scale. Beginning in 1963, a group called Friends of the Market sought to persuade the city to adopt an alternative to wholesale demolition. As a result, voters in 1971 rejected the renewal plans and established a 7-acre historic district. Popular support was based in part on the success of private preservation efforts in the Pioneer Square area of the city. Seattle is now replanning the market area to maintain the continuity of activity there and upgrade the structures to meet minimum requirements. The remaining 22 acres of the renewal area, although not in the historic district, is now seen as a necessary transition zone between the market and the nearby high rises. People are attracted to the market to shop or just to stroll and "people watch."



Many fine older buildings have been saved as active and viable parts of downtown. Shown here are (1) the Old Executive Office Building in Washington, D.C., (2) the interior of the restored Auditorium Theatre in Chicago, and (3) a before-after view of the renovated Heinz Hall in Pittsburgh.

## Space—the Setting of Downtown

It is obvious that the viability of downtown in American cities cannot rely simply on saving a few old buildings or designing the new buildings to fit in well. It is not enough, either, to look only at the variety and diversity in style of the buildings as they relate to one another. There are other things than buildings that make a city what it is.

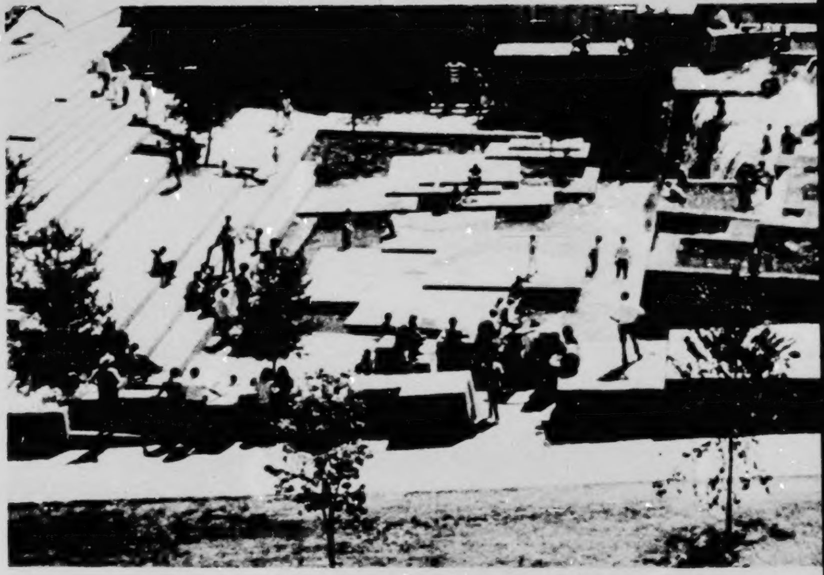
One important ingredient is space—the parks, plazas, vacant lots, sidewalks, streets, and greenery that are used at the same time to separate and to connect the structures. Open space can be a crooked cobblestone alley in an old New England commercial center or a broad expanse of palms along a boulevard in a southern or southwestern city. It can be as intricate as a Victorian fountain or as expansive as Central Park. And it can be filled with human activity or devoid of it.

Too many city planners have confused concentration with congestion. In their efforts to rid our downtowns of traffic and noise and pollution, they have also rid them of life. Whole sections of cities have been torn out and replaced with open areas that remain little used because they are no longer near activity.

The key to space in the city is use, not size. Some of our center cities are blessed with large parks which attract people and activity; the Boston Common and Grant Park in Chicago are examples. But most have only smaller places. Recent studies in Manhattan indicate that small spaces can bestow the same benefits as larger parks in the city, if they are designed for people.[9] Too often, however, such spaces do not provide places to sit, places to congregate, or places to be alone. Many office building plazas, in fact, are designed by architects as "low maintenance" to please building managers. This means that there is no comfortable place for people to sit and talk, thus no management problems with litter, noise, or vandalism. The Manhattan studies show that small design details (walls at sitting height and facing the street where people walk by, for example) can make a major difference in how we perceive and use space downtown.

The Auditorium Forecourt Fountain in Lovejoy Plaza in Portland, Oreg., is an open space that works. Designed as part of a HUD-supported urban renewal program, it takes up an entire city block with a multilevel fountain that attracts waders and strollers. It also serves as an amphitheatre and is dramatically lighted at night. It attracts a steady stream of activity, and the 11:00 a.m. startup of the fountains each day has turned into a public event. The public shares in using and protecting the fountains, and a voluntary patrol of teenagers has been formed to enforce rules where necessary.

Many cities still have laws on the books that discourage the public from more active use of the space that is available. "Keep off the grass" signs, rules against wading in fountains, and antiloitering laws discourage activity in parks and plazas. Even more important are



The auditorium forecourt fountain in Portland, Oregon, is open space that

restrictions on street vendors, sidewalk cafes, and spontaneous entertainment in parks. There is probably a close correlation between the vitality of our cities and the willingness of law enforcement officers, courts, and city officials to permit these activities. In many cities citizens have worked to repeal such ordinances. Streets and sidewalks and parks are as much a part of downtown as the buildings that are there. They should reflect the same level of activity.

Greenery also makes a difference. One of the environmental factors that attracts people to the cafe at 77 Water Street in Manhattan is the close spacing of the trees. Thirty honey locusts were clustered in one group, and 20 were placed in rows along the street, many more than the city rule of 1 tree each 30 feet. Minneapolis redesigned its main shopping street by filling it with trees and flowers, banning automobiles, and redesigning the sidewalks to curve among the plantings. The result is a pleasant shopping experience with the feel of the city and the comfort of a suburban mall.

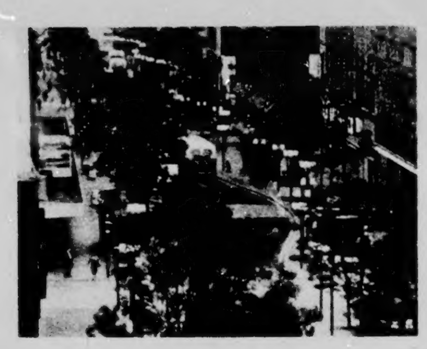
Another interesting approach to providing greenery for cities comes from Florida, where citizens have formed the Greater Miami Tree Conservation Bank, dedicated to growing and protecting valuable trees. Although the emphasis of the group is on establishing seedlings and planting smaller trees in the city, they also seek to save bigger, older trees where possible. Under a program now being set up, if trees are found in the way of a project or development, the owner

adds to the vitality of city life.

would call the tree bank. The group would prepare the trees for relocation well in advance, remove them at the proper time of year, and issue a valuation to the owner for tax donation purposes. The trees would then be replanted along streets and highways or in parks.[10]

Many city sidewalks serve only as ways of getting people around town. Yet the Manhattan studies show that many people use sidewalks as places to congregate and talk with others. Designers are beginning to experiment with varying widths, shapes, and patterns of sidewalks to encourage more activity. The black and white terrazzo sidewalk between 78th and 79th Streets on Madison Avenue, for example, adds texture and continuity to the line of shops and galleries facing onto it. In addition, more and more U.S. cities are learning what Europeans have known for centuries—that sidewalk cafes downtown can be attractive additions as well as economic successes.

Street closings are still another opportunity to use space in cities. A wide range of experiments has been tried by about 40 cities of all sizes.[11] Some, like Fresno, Calif. have tried closing the shopping street to all but pedestrians. Others have followed the lead of Minneapolis's Nicollet Mall and limited traffic to buses and taxis while granting priority to pedestrians. Some are as short as the single block closed off near the old law offices of Abraham Lincoln in downtown Springfield, Ill. Others, as in Salisbury, Md., comprise most of the downtown shopping area.



One of the most successful efforts to make downtown shopping districts more attractive is Nicollet Mall in Minneapolis, where traffic is limited to buses and taxis.

Street closings need not be permanent either. In fact, where they are done on a periodic basis, they can take on a special festive air, partly because live entertainment and other attractions often accompany such closings. In part it is the sense of freedom—almost of victory—that a pedestrian gets from strolling down the center of a street he saw filled with traffic and fumes a few hours before. And in part it is the pure joy of the unusual. Philadelphia has closed off one of its main shopping streets to traffic several nights during the summer and the crowds have gathered to shop, to take part in entertainment (both planned and spontaneous), and simply to stroll in the warm night air. Madison Avenue in New York has been the scene of similar activity when closed to traffic at lunch hour on an experimental basis. At such times, carbon monoxide and noise levels have been reduced 50 percent.

## Vitality—the Human Component Downtown

A third element, when added to structure and space, makes a city. And that is its people. As planners have learned, the most magnificent architecture and the most majestic parks mean nothing if people are not attracted to them and held there. A walk along Detroit's riverfront at 9 p.m. on a weekday night, for example, is a walk through a city without life—despite tall buildings and bold architecture and grand open spaces. The overall impression is desolation.

Diversity of use has been an important factor in keeping alive the downtown areas of many cities. After the businesses close, there needs to be other activity to take up the slack. Those cities where people live in or near downtown seem to stay alive more, to serve as the center of things not just from 9 to 5 but around the clock. New York and San Francisco are cities like that, and others like Philadelphia and

Temporary street closings, exemplified here by Madison Avenue, can be festive occasions and offer welcome respite for people who work or live in the city.

Boston have learned the value of holding onto and preserving those fingers of residential living that reach toward downtown. Other cities have lost the chance to do the same because of poorly conceived urban renewal plans or commercial high-rise construction that cleared old residential neighborhoods in the name of progress.

Private initiative has found a ready market for night life in the downtown of some cities. San Antonio and Atlanta are stunning success stories. A narrow river snakes through downtown San Antonio a few feet below street level. Citizens with foresight converted part of its length to parkland many years ago. But recent efforts have made the riverfront into an exciting center of restaurants, cafes, and entertainment strung out through the park in a flow that draws people from throughout the metropolitan area. New hotels have sprung up along the river and old ones have been refurbished. The result is a town center that serves around the clock as a place for San Antonians to come and take part in the life of their city.

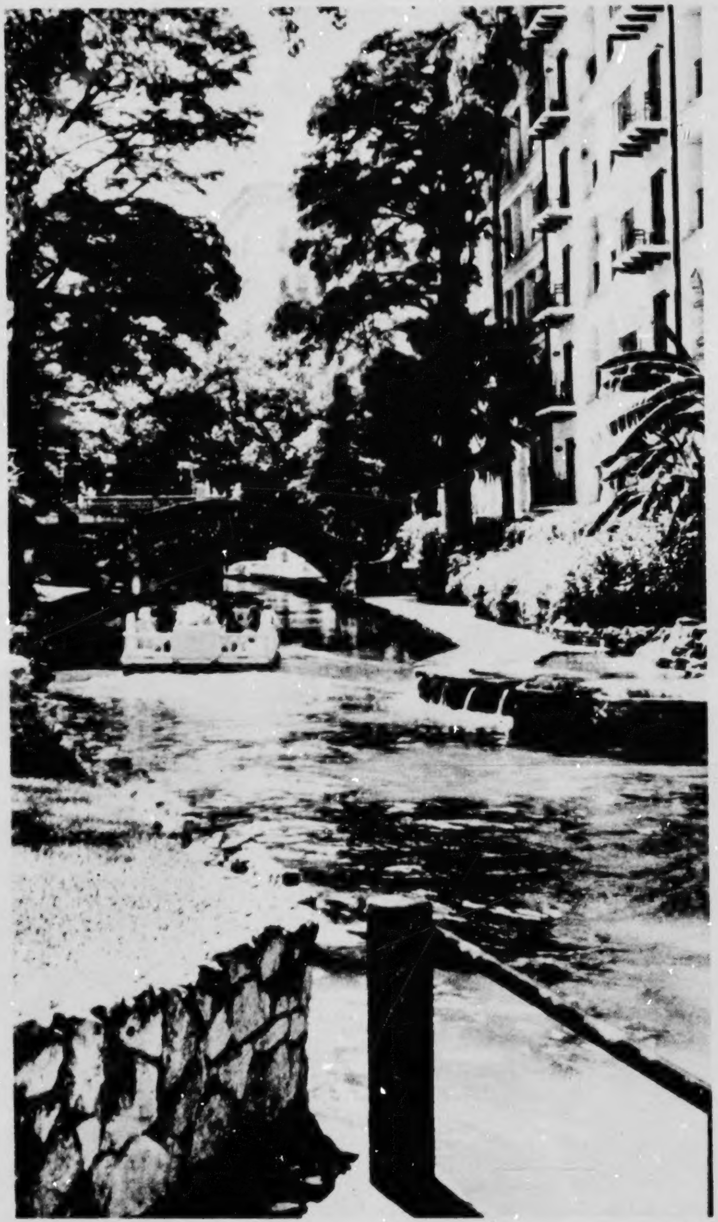
The Atlanta experience is similar but unique in its way. Around the turn of the century, the city rebuilt its downtown streets at a higher elevation, 20 or so feet over the old. Over the years, the old rights-of-way became filled with trash and debris. Beginning a few years ago, a group of investors cleared out the trash, built some pubs and restaurants in the old warehouses, gaslit the streets, and Under-

The cities that are liveliest are that way in part because they have valued and preserved older residential areas in and near downtown.

ground Atlanta was born. Today it flourishes under several city blocks, alive with people, music, good food, entertainment, penny arcades, and street vendors. There is something for everyone from the old streetcar at one end to the steam calliope at the other.

Some efforts to rekindle urban vitality, particularly by the private sector, have taken advantage of facilities left behind in the move of industries to suburban locations. Warehouses have become centers of shops and restaurants, as at Canal Square in Washington, D.C. An abandoned chocolate factory and an old cannery in San Francisco have become focal points of activity in that city, reincarnated as Ghirardelli Square and The Cannery. St. Paul is planning to do the same with its old warehouse district, and similar projects are planned for other cities.

Retailing in the downtown commercial areas of our cities has been declining for years, as activity has moved to suburban shopping centers. A recent study by Real Estate Research Corporation,[12] however, throws new light on a number of issues related to downtown retailing. The study, focusing on Denver, Seattle, and Pittsburgh, concludes that downtown retailing is relying less on "metropolitan shoppers" and more on center city residents and shoppers attracted downtown for other reasons—employment, business, tourism, entertainment, and the need for specialized services. At the same time, the decline in the ratio of downtown store sales to suburban shopping center sales seems to be leveling off, and some center cities are on the rebound. The interest of downtown shoppers and consumers in general is shifting toward high-quality clothing and home furnishings. As a result, retail outlets dealing with standard brand items may be forced to consolidate into larger units. But the report



Restaurants, shops, and hotels appear among the greenery in San Antonio's River Walk, which serves the city as a park as well as the center of night life.

Ghirardelli Square in San Francisco was once an abandoned factory on the waterfront; today it is alive with activity.

predicts that there will be spiraling demand for specialty stores, small shops, and boutiques with wide assortments within limited lines of goods.

The changes occurring in the structure of retailing, melded with new efforts to bring night life and round-the-clock activity to downtown, reinforce what was said earlier about how we use structures and spaces in the city. The trend is toward human scale, variety, and diversity. The design of downtown must accommodate small shops, night spots, and special services not available elsewhere.

In summary, the three elements discussed here—design, space, and vitality—are closely interrelated, and all are required to make our downtown areas exciting and interesting places to be. There are examples of successes with each element, and there have been miserable failures with each. What can be said is that we are entering an era of innovation downtown, a time when issues of scale and mix and diversity will become part of the necessary vocabulary of interested citizens. In each case the judgments will differ over what is "good" for downtown and what is not. In the long term, the answers will be found in the form that our downtown areas take and by whether or not they can serve as the center of things without losing the human elements that also make them attractive places to be.

## Four Neighborhoods—the City as a Place to Live

The 1970 census showed that, for the first time, suburbanites outnumbered city dwellers in the United States.[13] Great significance has

An old neighborhood in Boston wends its way down to the Charles River.

been attributed to this phenomenon, with commentators now calling us a nation of suburbs.

But from another perspective the same data lead to a different conclusion, that despite the massive movement to suburbia since the end of World War II, there are still almost as many people living within our central cities as in the surrounding suburbs.

Some have said that they remain there simply because they cannot get out for reasons of economics or racial prejudice or prefer not to leave because of age. Even subtracting these groups, however, there remain many people who evidently want to live in the city. They are people of all kinds, although city life seems to appeal particularly to the young, the wealthy, childless couples, single people, and the elderly.

Many are attracted to city neighborhoods because they are generally convenient to activities, stores, cultural events, public transportation, and the office complexes of the central business district. Compared to most suburban neighborhoods, they present a pattern of diversity in architecture, landscaping, neighbors, and shops that is intensified by the ease with which things can be reached on foot. They are places with a human scale, places that make use of space in creative ways that catch the eye. There are sidewalks. The trees are mature, the parks are well established. And large-scale shifts in land use are less likely to occur nearby than in the suburbs. In short, there is a pleasantness in movement through an older neighborhood that is seldom captured in a new subdivision on the urban fringe.

Of course, living in the city has its drawbacks. First of all, while rapid physical change occurring in many suburban areas—woods, fields, and streams giving way to bulldozers—is acceptable to many, the subtler shifts in the economic and racial structure of some older neighborhoods in the cities are not. The deepseated fear remains that social change threatens property values. The housing stock is generally older in the city, and repairs can be costly and unsatisfactory. Public services in the cities have not always kept up with those in wealthier suburban areas, in part because many city services benefit commuters as well as residents and thus cost more to provide. Freeway construction and the "upgrading" of arterials and feeder streets are constant threats to established neighborhoods, often increasing noise and congestion. And finally, fears of crime, drugs, and poor schools drive out many, especially families with children.

Everyone who lives in a metropolitan area has at one time or another weighed these factors. Some decide that the cities are hopeless; others conclude that a city neighborhood is the only place to live. Still others, because of racial discrimination or economic status, do not have a real choice.

After many years of continued movement to the suburbs, there is beginning to arise in many American cities a sense that perhaps the city is a good place to live. This is due in part to disillusionment with suburban living patterns, which some are beginning to feel opt for homogeneity at the expense of diversity. In part it is the burden of commuting and a sense that as more and more commercial and residential development follows them, the only way to find the values that originally made the suburbs attractive is to move still farther from the city. And in part it is a growing attraction to older neighborhoods of the city itself as a place to live.

Added to these factors is evidence that at least some of the disadvantages of city life are no longer worsening and that there is a reduced differential between cities and suburbs. Rates of serious crime, for example, are on the increase in the suburbs and are falling off in a number of cities.[11] The teenage drug problem has now reached even the most remote suburbs. Citizen efforts to stop construction of disruptive and nonessential urban freeways are trying to save older neighborhoods in some cities like Memphis and Baltimore, and in others like Boston public officials have adopted new policies to reduce the construction of more expressways. Further, as a result of past controversies, many urban highways are being designed better or eliminated from plans. At the same time, the new subway systems being built in Atlanta and Washington and being planned for other metropolitan areas will in many cases serve city neighborhoods years before they reach remote suburbs, making the commuting advantage of city living even greater.

To illustrate some of the things that are happening throughout the country to make cities better places to live, we have focused on four kinds of neighborhoods. Each offers its own set of problems and opportunities. First are the historic neighborhoods, important because they are often the first step toward making older parts of our cities places where people want to live. Second are the older neighborhoods with some special charm, the kinds of places that lure the young and affluent, who move in and often restore the houses. Third are the older neighborhoods which are relatively stable in composition: in the past they have received little attention, but they often retain a strong sense of community from long-term residents. And finally are the neighborhoods that grow out of urban renewal and private redevelopment. Each of these has its contribution to make to life in our cities. As in the discussion of downtown, our interest here is to show how some places and some people have been able to hold onto or to bring back to our cities some of the excitement and the vitality they once had.

## The Historic Neighborhood

The earliest private efforts to preserve neighborhoods in many of our cities were tied to historic districts. In some cases these old neighborhoods had survived the decay around them, but in others they had to be brought back from years of neglect.

Each city's story is a little different. In Boston, Beacon Hill never lost its elegance as much of the surrounding area became blighted.

Similarly, in Philadelphia a block-long section of Elfreth's Alley held on and helped inspire the Society Hill restoration that now covers many blocks of the city. Charleston was one of the first cities to recognize the architectural and tourist value of its historic district. Savannah held onto its unique set of colonial urban squares while much wealth moved elsewhere in the city. Georgetown, an elegant restored residential area in Washington, D.C., was until recent decades a rundown neighborhood suffering from the loss of canal and river trade.

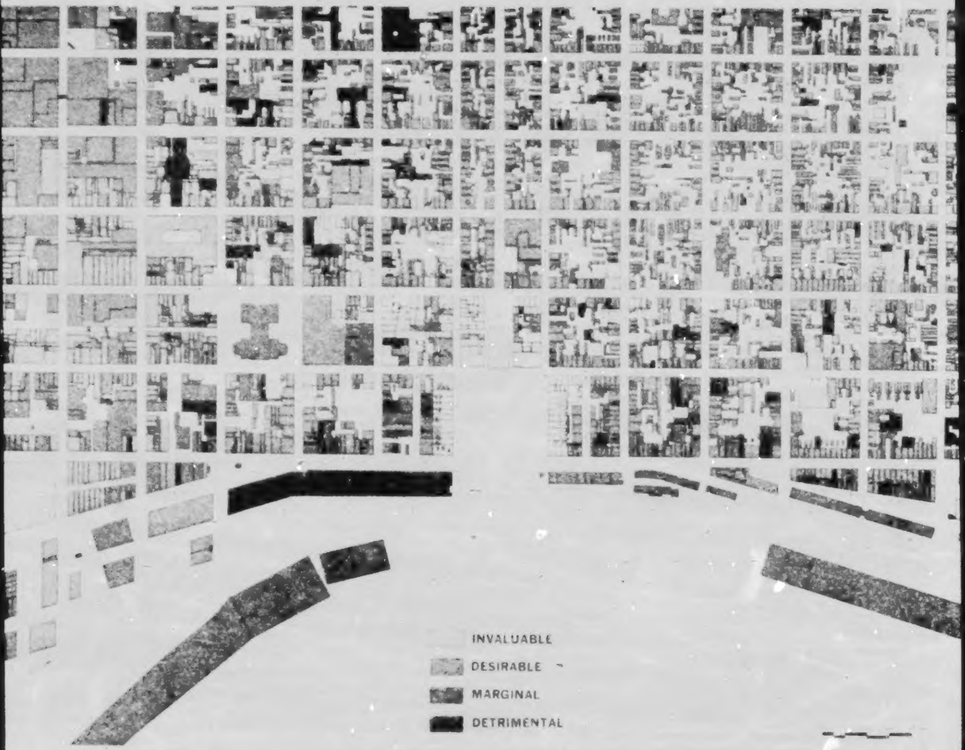
Today the historic preservation effort is underway throughout the country, as citizens work to save some of the past that made their cities distinctive and gave them their personality. Louisville citizens, for example, have the restoration of Old Louisville well underway. The rejuvenation of this historic sector has inspired other neighborhood improvement efforts throughout the city.

The French Quarter waterfront in New Orleans was saved from an expressway that would have sealed it off. A plan to preserve this valuable historic and architectural district has been drawn up to ensure that new development enhances rather than destroys the atmosphere of colonial France, dixieland, and the blues. As part of the plan, an index has been devised to classify the existing structures as invaluable, desirable, marginal, or detrimental, according to how they contribute to the character of the neighborhood.

In all these efforts there is a danger of too narrow a focus after long years of neglect. Sometimes preservation efforts are organized only to save a single old building or one small area. But citizens have learned that an all-out effort to save specific structures that are threatened is often too little too late. Groups in some cities are working instead on a broader front to redirect demolition ordinances, building codes, and urban renewal to a more thoughtful consideration of preserving historic values. Don't Tear It Down, a Washington, D.C., organization, is an example of this type of group. Although it has often succeeded in saving a single landmark from destruction, it sees its more important task as working closely with neighborhood groups and the local government to fuse the historic preservation movement into what is going on to improve the urban environment in all neighborhoods of the city.[15]

Many restored historic neighborhoods have become today the most prestigious addresses in the metropolitan area. The man who was the first to renovate an old home in Georgetown not so many years ago was considered a fool; today the neighborhood is Washington's most renowned. If anything, the problem today in many historic neighborhoods is that they are *too* chic, *too* elitist, and need more diversity of residents. Often this is possible by judicious use of local ordinances to permit some old structures to be converted into apartments. This attracts singles, young couples, students, and others into the neighborhood without disrupting its value as an historic district.

Throughout the country, efforts are underway to bring back historic districts as active residential neighborhoods. Above are examples in Philadelphia and Savannah.



As part of the plan for preserving the old French Quarter of New Orleans, a "treatment index" was developed to identify the contribution of each building to its neighborhood.

## The Neighborhood with Special Charm—Renovation with Dislocation

Many urban dwellers, particularly young couples and singles, have discovered the exciting and pleasant environment that is possible in older neighborhoods—ease of movement as a pedestrian, shops and stores where customers are greeted by name, and compactness without congestion. They are moving into these neighborhoods, buying the old houses, and working evenings and weekends to fix them up. They are a small and special part of the urban community, usually young, relatively affluent, and unencumbered by debts or large families, but they are a growing factor in the life of our cities.

Nearly every city has such areas—The Fort Greene-Clinton Hill section of Brooklyn, the German Village in Columbus, Inman Park in Atlanta, and Capitol Hill in Washington, D.C., are but a few examples. Others are in New Orleans, Louisville, Philadelphia, and many other cities. They are pleasant, well-kept, increasingly safe neighborhoods which capture a vitality and charm not possible in the suburbs. They serve as magnets, attracting people back to the city. Like all urban neighborhoods, they have their problems, but the housing costs and rentals reflect the growing demand for this style of urban living and convenience. Sometimes these neighborhoods attract in part because of the historic role they have played in the life of the city, but usually the houses are more comfortable than elegant, the neighborhood more "put together" than restored.

Those who are attracted to these neighborhoods and undertake to rehabiltate one of the old homes are often faced with major obstacles. Financial institutions may be reluctant to help with loans and mortgages until the neighborhood has undergone substantial upgrading. City ordinances can set up an array of confusing and detailed requirements which seem overwhelming to the individual homeowner at work in his spare time. Building codes are often insensitive to design innovation and new technology in building materials. Even overzealous historic preservation groups can do harm in some neighborhoods by showing greater concern for authentic details and fixtures, the cost of which must be borne by the homeowners, than for the need to encourage renovation activity and neighborhood vitality in general.

It is ironic that so many of these obstacles have emanated from the very people and institutions that should be most interested in the revitalization of the city. Through reforms of public bodies and enlightened new policies in the private sector, some of the obstacles are being overcome. In fact, the increasing popularity and expansion of these neighborhoods represent the victory of individual determination and institutional reform over the ill-conceived practices of the past.

The chief drawback of these neighborhoods is that they foster rehabilitation by dislocation. Although in some areas, such as Capitol Hill in Washington, new residents have joined with old to find ways to keep the neighborhood racially and economically mixed, it is a difficult challenge to meet. Over time, affluent neighbors, rising property taxes, a sense of not belonging, and an inability to afford the substantial rehabilitation often required for the housing lead older, poorer residents to move out. Unlike urban renewal, there is no public effort to help them find housing they can afford. Many have lived in the neighborhood most of their lives and may not want to move to another area. For these older residents, the chief consolation is that the popularity of the neighborhood has increased the value of their home, and it brings a good price.

More and more cities are experiencing the phenomenon of private renovation of one or more old neighborhoods by predominantly young and affluent residents who move in and fix up the existing homes. Above is Capitol Hill in Washington, D.C.

In spite of the dislocation they cause, the appearance and growth of these neighborhoods are an important trend in many cities They are physically far less disruptive than urban renewal. On balance, most see them favorably as opportunities to draw people back to live in the city, and fast-rising residential property values are a welcome and unusual experience for many city governments. Unlike urban renewal, these neighborhoods are coming back because there is a demand on the open market for the way of life they offer. The concern, then, is to make these neighborhoods work as magnets to bring people back to the city, while at the same time assuring that they grow with minimum disruption to those now living there who want to stay.

## The Stable Neighborhood—Preservation without Dislocation

With historic neighborhoods being restored and with some older neighborhoods with special charm being converted into residential areas which attract the young and the affluent, the challenge for many cities has shifted to programs to upgrade and preserve viable, older neighborhoods without disclocating the resident populations.

This is not an easy task. Housing often needs extensive repair and rehabilitation; neighborhood amenities such as streets, parks, and community facilities are often poorly maintained; and problems of crime, drugs, and inadequate schools discourage owners from continuing to invest in the old neighborhoods.

Preservation of these older yet still viable neighborhoods has attracted relatively little attention in the past. Federal programs have traditionally been directed toward the worst housing areas where often little or no neighborhood fiber remains upon which to rebuild a sense of community. Emphasis has been on demolition, clearance, and construction of new publicly supported housing. It is ironic that in many cities today private restoration efforts spread through older neighborhoods up to the door of public housing projects, then stop. Even if one could be obtained with private capital, no one wants to restore a 10-year-old abandoned public housing unit as much as a 60-year-old row house that has withstood 30 years of neglect.

In some cities, the example of older neighborhoods coming back to life has led to a general resurgence of confidence in surrounding neighborhoods and has reversed their decline. In these areas, the long-term residents are upgrading their homes and working on neighborhood preservation programs that put priority on keeping the same residents. In some cities, such as Milwaukee and San Jose, there are programs to provide tools and repair assistance to residents.[16]

After focusing for years on historic Old Louisville, where hundreds of houses have been rehabilitated, attention has now moved on to many other parts of the city. Public and private activity has turned to saving not just the structures but also the character of the neighborhoods, with streets and parks that attract people. Long-time resi-

Preservation efforts need not be limited to historic structures or elegant neighborhoods; much can also be done in older, stable neighborhoods where residents take an interest. Shown here are Mount Auburn, in Cincinnati, and Butchertown, in Louisville.

dents of Butchertown, an old German district near downtown, organized first to fight industrial zoning, then turned to the rehabilitation and restoration of older homes in the area. While outsiders have begun to move in to buy and restore homes, the people who have long lived there remain the prime force behind the neighborhood improvement efforts.

Other groups have found that neighborhood organization and voluntary work can rekindle an atmosphere of hope and can trigger improvements. The Low Cost Housing Corporation in South Boston is a good example. For a while it experimented with Federal Government assistance through HUD. But the neighborhood group concluded finally that the added cost of such Federal requirements as union labor, approved architects and planners, and ceramic baths might make the job so expensive that the poor could not afford the rents. So the group went its own way and instituted a volunteer program. One official of the Corporation claims that this lowered the rehabilitation costs per housing unit from about $17,000 under the HUD program to about $8,000. Since 1968, the group has rehabilitated 19 buildings with 66 apartment units.

Other cities and states are shifting their urban renewal efforts to more rehabilitation and less demolition and are otherwise sponsoring neighborhood preservation and renewal in a way that encourages the same residents to stay. Thirty states now have housing finance agencies, up from a few just 5 years ago; more and more are following the lead of the Michigan and Massachusetts agencies and emphasizing rehabilitation programs. Pittsburgh, where the History and Landmarks Foundation assists and counsels neighborhood groups, and Cincinnati, where the Mount Auburn area rehabilitation has stressed keeping its residents, are two examples of city programs that work.[17] In other cities, such as Detroit and Minneapolis, the business community has organized to help with seed money and other support.[18] There are signs in these and other areas that upgrading older neighborhoods in our cities could be a general trend and a viable alternative to demolition and clearance for the poor.

Many neighborhood groups have found surveys useful first steps toward a program of neighborhood improvement and preservation. An excellent example of such a neighborhood environmental survey is one done by residents of the Old West Side neighborhood of Ann Arbor, Mich.[19]

Citizens in an older neighborhood in Ann Arbor have worked out their own neighborhood improvement and preservation plan.

They first identified the neighborhood boundaries. Then they agreed upon a set of principles to identify what makes the neighborhood a special place, what attractive features need to be protected and enhanced, what the scale of new structures and the use of space should be, and what kinds of changes and dynamics the community could best adjust to. The results, developed with the aid of a grant from the National Trust for Historic Preservation, call for thoughtful policies to maintain the character of the neighborhood and still to accommodate the changes in residence patterns and housing demands sure to come in future years. Small grants for similar efforts are also available from the National Endowment for the Arts.

Once a neighborhood completes a survey, it should work with local authorities to protect and enhance existing valuable elements of the neighborhood and to properly design and integrate new development. This is crucial because the best program of neighborhood improvement can be rendered valueless by city hall decisions to permit new construction which is out of scale or which otherwise overtaxes the "carrying capacity" of the neighborhood.

As in our downtown areas, the use of space is important in older city neighborhoods. It comes in many forms—yards, alleys, sidewalks, parks, vacant lots, and even the streets themselves. Although some neighborhoods need more public places like parks, others have parks which are underused and often in disrepair. In some areas, ill-advised urban renewal programs, abandonment, and debris-filled vacant lots have left neighborhoods with too much space between groups of buildings. This has effectively destroyed the sense of community and security that earlier derived from solid blocks of structures with an occasional park or playground. Some cities give priority to filling in these spaces or at least converting the vacant and abandoned lots to vest pocket parks.

Recent studies in Baltimore show that residents must perceive a neighborhood as safe before they will let their children use its parks.[20] The studies were made of three contiguous urban residential neighborhoods, one middle-income and two low-income, to trace patterns of outdoor space use in the summer months. They concluded that the physical design of play areas is less important than the location, who else uses it, and whether it is supervised. To the extent possible, people prefer recreation adjacent to their residences. This is for convenience, security, and the ability to maintain visual links with home. The studies also showed that in low-income neighborhoods, adults tend to socialize in public areas, using sidewalks and streets especially. Because the young do the same, secluded parks are very little used. In such neighborhoods, open space facilities need to be designed as congregating places where there is action—rather than as retreats. Even in middle-class neighborhoods, where socializing is generally indoors or in enclosed yards, parks are used most if they are small and convenient to housing.

Children in a South Boston neighborhood play in a vest pocket park built around the cellar floor of a dilapidated house cleared from the site.

Much of this simply reaffirms what Jane Jacobs said 12 years ago about the need to recognize streets, sidewalks, and the smaller public spaces around houses in a neighborhood as the centers of recreation.[21]

This is not to say, however, that the nonuse of neighborhood parks cannot be remedied by recognizing their value. Parks can be made livelier places where people gather to take part in neighborhood activities. Many cities, including Boston and Washington, D.C., schedule extensive programs of live entertainment in neighborhood parks during summer months.[22] But this is no substitute for spontaneous activity there by the residents themselves. As with parks downtown, the vitality can rise or fall on such simple things as whether or not people can picnic, walk on the grass, or wade in the fountains and whether street vendors are allowed.

Two interesting examples of the use of parklands bear mention. Along the Fenway in Boston, residents are permitted to till small plots of flowers and vegetables of their own. This not only provides recreation for many but fills the edges of the park with a panorama of color and texture. In Washington, D.C., children from inner city neighborhoods have worked together on plots of land set aside in the parks to grow a profusion of flowers and vegetables, which they then sell or take home. Many a suburban commuter has done a double take as he turned his head from the freeway traffic jam to see a field of corn and cucumbers surrounded by big red zinnias.

Empty lots can also become places for community open space. Philadelphia has a program to turn over tax-delinquent properties to neighborhood groups who then clear them and convert them into vest pocket parks.[23] On a larger scale, New York City converted the site of the old Ruppert Brewery, slated for future high-rise development, into a low-budget multiblock community park until it was needed for construction. Headed by a group of concerned citizens, the rubble-strewn acreage was regraded into a rolling meadow and seeded. Neighbors grew gardens, and several festivals and park events were held there until construction of the new housing began.

In summary, space in neighborhoods is a commodity sometimes in short supply but always in need of good design, proper maintenance, and innovative techniques to integrate it into the community lifestyle. Where people have come up with the ideas, open spaces have become vital parts of the life of the neighborhood, places that attract activity while still providing the relaxation and respite that people seek in neighborhood parks.

The way the city designs and uses thoroughfares also influences the way a neighborhood holds together and keeps its vitality. Expressways are too often designed with greater concern for the natural boundaries of rock strata than for the traditional boundaries of neighborhoods. Commuters have been sped to downtown destinations by converting numerous older residential streets to 1-way arteries with lights timed for speeds approaching 40 miles per hour. Philadelphia, Baltimore, and Madison, Wis., are unfortunate examples of cities that have fragmented whole neighborhoods with such policies. Studies that have compared numbers of visits between neighbors on such streets and on other nearby streets show how deeply these projects have cut into neighborhood continuity.[24]

A final factor in maintaining the vitality of neighborhoods is the need for city officials to understand, predict, and accommodate the needs of neighborhoods as they undergo change. If more families with children are moving in, there is greater need for playgrounds, schools, and swimming pools. These are less important than pleasant parks, police protection, and health facilities if the residents are elderly and stable. Cities need to recognize and plan for these differences so that as neighborhoods change, the degree and kind of public services available will change with them.

## The Renewal Neighborhood—Creating the Community

Another type of neighborhood that has brought special opportunities and special problems to many cities is the renewal neighborhood. It is usually built on a site convenient to downtown and replaces an older neighborhood that has come on hard times. Often it includes high-rise apartment buildings, though it is popular to surround them with smaller-scale development such as townhouses and garden apartments.

Some of these neighborhoods—the Southwest in Washington, D.C., and the West End in Boston are two examples—are born of federally supported urban renewal efforts. Others are private redevelopment efforts advertising low-maintenance modern apartments and residences with central location. Still others fall into the category of "new towns in town," projects funded under cooperative agreements between the Federal Government and private developers to build whole new communities for thousands within the city. Already underway is Cedar-Riverside in Minneapolis, and projects are planned for San Antonio, Chicago, and New York City. For the sake of convenience, we call all these developments renewal neighborhoods. Although their sponsorship and financing vary, we are interested here in examining some of their common characteristics.

Renewal neighborhoods have helped to keep middle-income people from moving out of cities, to improve housing conditions for the poor, and, in at least some cases, to attract back the relatively affluent. They offer well-designed residences with modern conveniences. They require little maintenance from residents, provide for personal security, and are usually convenient to downtown activities. They often offer a full range of community facilities such as pools, tennis courts, and health clubs, and nearly all offer a range of shops and services. They may even have a schedule of weekly social activities arranged by the management. In short, renewal neighborhoods offer a life-style stressing activity and convenience in a single locale combining places to live, shop, socialize, and exercise. It is a life style that attracts many Americans.

Renewal neighborhoods, however, are not without their problems. High on any list is the issue of dislocation. Many renewal neighborhoods, especially those that date back to the early years of the Federal Government's urban renewal program, generated severe relocation problems for low-income residents. Long-time residents suddenly found their neighborhoods defined as "blighted" under the confusing and often self-serving definitions used by renewal authorities. The mass demolition and clearance that attended urban renewal left thousands with no option but to find new homes in other parts of the city, thus worsening the already adverse conditions in those neighborhoods. Even the recent substantial improvement in relocation laws and benefits has had only limited success in ameliorating these impacts. And the best efforts to provide more housing within renewal areas for those forced out of their homes by construction projects have run up against serious problems of social and economic integration.

An equally important problem in renewal neighborhoods, occurring regardless of the mix of housing types and economic levels, is the lack of existing fiber upon which to build a sense of community among the new residents. To some extent this is due to the newness itself, the lack of continuity between old and new neighborhoods. But it also relates to the absence of any active participation by residents in the design and construction of the renewal neighborhood. Although there is sometimes a citizens advisory committee, the physical structures are built for the residents and are there as givens when the first residents arrive. This contrasts sharply with circumstances in other neighborhoods we have discussed, where even the newest residents become quickly immersed in decisions about how their house and their neighborhood will take shape.

Nevertheless, there are examples of renewal neighborhoods where a sense of community has developed. St. Francis Square in San Francisco is one. The 229-unit garden apartment complex was completed almost 10 years ago as a HUD-supported low- and moderate-income project. Because of its unique design, it has remained a well-maintained, high-occupancy project with strong community spirit in a high crime area of the city. The buildings are turned inward with open space opposite the living rooms. The low-rise structures are arranged in rectangles with a center area that attracts activity and still assures security and visual contact between residences and play areas. There is extensive use of trees and grass throughout the public areas, and the architecture is reminiscent of single-family row houses.

Wooster Square in New Haven, Conn., is another innovative effort by urban renewal authorities. The problem faced was how to upgrade the neighborhood without destroying its architectural and historic character or forcing the residents to relocate. The renewal program was designed to emphasize rehabilitation of existing structures and to put most public money into public facilities such as schools and parks. The result is a neighborhood that keeps its charm while providing variety, vitality, and security for residents.

There are other elements of design in a renewal neighborhood that can help engender this sense of community. First, attention to balance among a variety of land uses in proper scale is necessary. Even residential use can be allowed to excess, resulting in no local commercial establishments to serve people in the immediate area. But city zoning laws often simply ban categories of uses and ignore the need for a mix. There needs to be more respect for different kinds of uses coexisting, for assuring each neighborhood its share of shops and convenience stores without overburdening it with strip commercial development.

Another priority should be to preserve or create community "watering holes"—taverns, stores, restaurants, and public areas where people can gather and see their friends. In the past, renewal erased blighted areas but provided few places in the redesigned neighborhood for people to gather. Renewal programs have encouraged high densities and have generally favored large-scale developers, thus designing in problems of neighborhood scale. In some large renewal areas, a shopping center is the sole commercial center, serving an

St. Francis Square is a San Francisco renewal project that combines many of the design elements essential to vital, stable, and secure neighborhoods.

Southwest Washington is a large-scale urban renewal area that embodies all of the limitations and opportunities of renewal neighborhoods described in the text.

area too large to allow neighborhood watering holes but at the same time rendering their existence at dispersed points throughout the project economically difficult.

Design can also affect crime rates. A recent book entitled *Defensible Space* theorizes that crime thrives in open, unguarded, inactive areas where criminals can lie in wait.[25] Such areas have been designed into some renewal neighhorhoods in the form of interior plazas, play areas blocked off from houses and streets, and extensive networks of halls in high-rise structures. The message of *Defensible Space* is that open areas should be placed adjacent to areas of activity or even face out onto streets and that apartments should be designed to minimize common areas within buildings.

*Defensible Space* studies also link the size of buildings to crime rates. Crime tends to rise with building height, and this phenomenon seems to be true even where moderate-income families live. More than anything else, the data in the study argue for smaller-scale residential structures and for open spaces adjacent to areas that already attract people and activity.

In summary, renewal neighborhoods require special care in design and execution to assure that they work as communities. By their nature, they produce problems of dislocation and a set environment of structures and grounds that makes it difficult to foster a sense of resident participation. In some cases, design can help to overcome these problems. In others, only time will erase some of the uniformity and starkness. It takes time for greenery to spread. And it takes time before people have an opportunity to express their own individuality and the neighborhood's diversity in decorating their homes. In the long term, it is the continued growth of this diversity that will make and keep renewal neighborhoods attractive places to live.

## Conclusions

The focus of this chapter has been those elements which lend a city its character and make it an attractive place to live, to work, and to be. Some downtown areas have found ways to renew and change to accommodate the older and more special things about the city. In general, this has come from careful integration of the scale and design of new structures with old. It has required special efforts to forestall the demolition of older buildings for parking lots and to encourage a mix of activities and a use of space that attract people. Although the general pattern of urban American downtown continues down a road to uniformity and dehumanization, the growing number of exceptions show that this is not inevitable.

The prognosis for urban neighborhoods is more complex. Large areas of our cities continue to need upgrading, and it is not clear that public assistance in the past has helped. Total reconstruction and total abandonment of our cities are equally unrealistic and unacceptable alternatives. The effort must be toward making them better places to live.

Some residential neighborhoods in cities have been saved as a part of historic preservation efforts. More widespread is the phenomenon—spearheaded usually by the young and affluent—of upgrading one or more neighborhoods in a city by individually restoring the old homes. Although this often dislocates older residents, a few cities have found neighborhood preservation and enhancement possible with a minimum of resident displacement. In summary, although hard results are difficult to verify, there is a growing movement toward holding onto and improving older neighborhoods in our cities. And even renewal efforts are beginning to apply the lessons of the past by emphasizing rehabilitation and the role of good design in building security, a sense of community, and a neighborhood scale into new projects.

The major unanswered question is the impact that these first small signs of change will have on two large masses of Americans—the relatively underprivileged in the city and the relatively affluent in the suburbs. Will the benefits of livelier downtowns and the first stirrings of healthier urban neighborhoods spread to the poor in our cities? Or is it merely a new outlet for the wealthy few? Will suburbanites begin at least in small numbers to return to the cities in search of the amenities they offer? Or will the crime, drugs, and schools in cities present a continuing unacceptable set of circumstances?

It is impossible to predict. What we do know, however, is that there are things that people can do on their own, working together and with their government, to make cities better places. It is, after all, the increment of the decisions of thousands of people that made our cities the complex and exciting places they once were. It will be the decisions of many thousands more, on their own and with others, that will bring them back.

## Footnotes

1. Arthur P. Ziegler, Jr., *Historic Preservation in Inner City Areas—A Manual of Practice* (Pittsburgh: The Allegheny Press, 1971), p. 10.
2. Los Angeles City Planning Department, based on a 1970 study by Wilbur Smith and Associates.
3. San Francisco Planning and Urban Renewal Association (SPUR), *Impact of Intensive, High-Rise Development in San Francisco,* Vol. IV, April 1973, pp. 18–25.
4. Mitzi Cunliffe, "The Eye and the Mind's Heart—The Aesthetics of Townscape," *Journal of the Town Planning Institute,* Vol. 55, No. 4, April 1969, p. 163.
5. See SPUR Study, *supra* note 3.
6. H.R. 5584, The Environmental Protection Tax Act of 1973.
7. For further information, see John J. Costonis, *Space Adrift: Landmark Preservation and the Marketplace* (Urbana: The University of Illinois Press, publication date: November 1973).
8. P.L. 92–362, 92nd Congress, 2nd Session (1972).
9. Presentation of William H. Whyte to the National Endowment for the Arts, Office of Architecture and Environmental Arts, in Washington, D.C., Jan. 4, 1973 (study report scheduled for publication in early 1974).
10. For further information, contact The Greater Miami Tree Conservation Bank, 5768 Sunset Drive, Miami, Fla. 33143.
11. District of Columbia Redevelopment Land Agency.
12. Al Smith, "The Future of Downtown Retailing," *Urban Land,* Vol. 33, No. 11, December 1972, pp. 3–10.
13. U.S. Department of Commerce, Bureau of Census, *U.S. Census of Population: 1970,* Vol. I (Washington, D.C.: U.S. Government Printing Office, 1970).
14. U.S. Federal Bureau of Investigation, *Uniform Crime Reports for the United States,* annual (Washington, D.C.: U.S. Government Printing Office).
15. For further information, contact Don't Tear It Down, Box 14043, Washington, D.C. 20044.
16. For further information, contact the Milwaukee Model Cities Home Tool Loan Center, City Hall, Milwaukee, Wis.
17. See Ziegler, *supra* note 1.
18. For further information, contact Metropolitan Detroit Citizens Development Authority, 2065 First National Building, Detroit, Mich. 48226; Greater Minneapolis Metropolitan Housing Corporation, 1030 Midland Bank Building, Minneapolis, Minn. 56401.
19. The Old West Side Association, Inc., *Old West Side, Ann Arbor, Michigan* (Ann Arbor: The John Henry Company, 1972).
20. Department of Planning of Baltimore, "Neighborhood Design Study Progress Report 2" (Baltimore, April 1972) (mimeograph).
21. Jane Jacobs, *The Life and Death of the Great American Cities* (New York: Random House, 1961), pp. 113–40.

22. For further information, contact Summerthing, City Hall, Boston, Massachusetts 02201; Summer in the Parks, National Capital Parks, 1100 Ohio Drive, S.W., Washingon, D.C. 20242.
23. For further information, contact The Neighorhood Parks Program, Department of Recreation, Room 1470 Municipal Services Building, Philadelphia, Pennsylvania 19107.
24. See Donald Appleyard and Mark Lintell, "Environmental Quality of City Streets: The Residents' Viewpoint," *Journal of the American Institute of Planners*, Vol. 38, No. 2, March 1972, pp. 84–101.
25. Oscar Newman, *Defensible Space* (New York: The MacMillan Company, 1972).

41/42

## CHAPTER 2

# Cleaning up the Willamette

Although the Willamette is our twelfth largest river, Lewis and Clark nearly missed it on their journey to the Pacific. They didn't notice it on their way down the Columbia River in 1805, nor did they see it on the return trip in the spring of 1806. It wasn't until they were more than 25 miles east that Indians told them of the river that flowed north into the Columbia. Clark returned, entered and explored its lower reaches. Over time, the river's Indian name "Wallamt" became the Willamette.

Much has changed in the century and a half since these explorers first came to the Oregon Territory. The Willamette River Basin, which stretches for 150 miles from its southern headwaters to the point near Portland where it meets the Columbia River, is now the home of 1.5 million people. The rich lands along the river have been cleared for fruit and vegetable farms. The wooded slopes of the Coast Range to the west and the Cascades to the east have been heavily logged. Along the river banks in the major cities—Portland, Salem, Eugene, and Springfield—lie factories, freeways, and other manifestations of our urban environment.

But in one important respect the Willamette River is now more like the river which Lewis and Clark saw than it was 10, 30, or even 50 years ago. What was then one of the Nation's most polluted waterways has been transformed once again into a clean river. Fifty years ago men refused to work at riverside construction because of the water's intolerable stench. Now thousands regularly swim, fish, water ski, and boat on summer weekends, and for the first time Chinook salmon ascend the Willamette to spawn in the fall.

The transformation of the Willamette has been written about from several points of view.[1] We are presenting this analysis for two reasons. First, Oregon's experience demonstrates how a major river can be restored if the people are determined, the government committed, and the legal tools available. Thus the Willamette experience is instructive as a model for the cleanup task ahead for other rivers of the Nation.

Second, the land along the restored Willamette is now a focus of public and private concern. Now that the waters are clean, the goal is to put the land to the most beneficial use. There are two different stories to tell about the land. One is the pursuit of the Greenway, in concept a parkway running the length of the river's shores. The Greenway is intended to protect the greenery and open space in a natural setting and to give the residents of the valley—and others—access to the water and wildlife. The other is Portland's effort to change the orientation of the city's waterfront so that people have the opportunity daily to take pleasure from the restored Willamette. Both stories illustrate the attention to land use that must accompany the Nation's water quality improvement program. They also raise a major environmental quality issue: having committed ourselves to the spending necessary to clean up polluted waters, how do we guarantee that citizens—who pay for pollution control as consumers and taxpayers—will have the opportunity to enjoy the benefits of their investment?

Before examining these issues in more detail, however, we need to understand the setting of the river and man's activities in the basin.

## The Setting

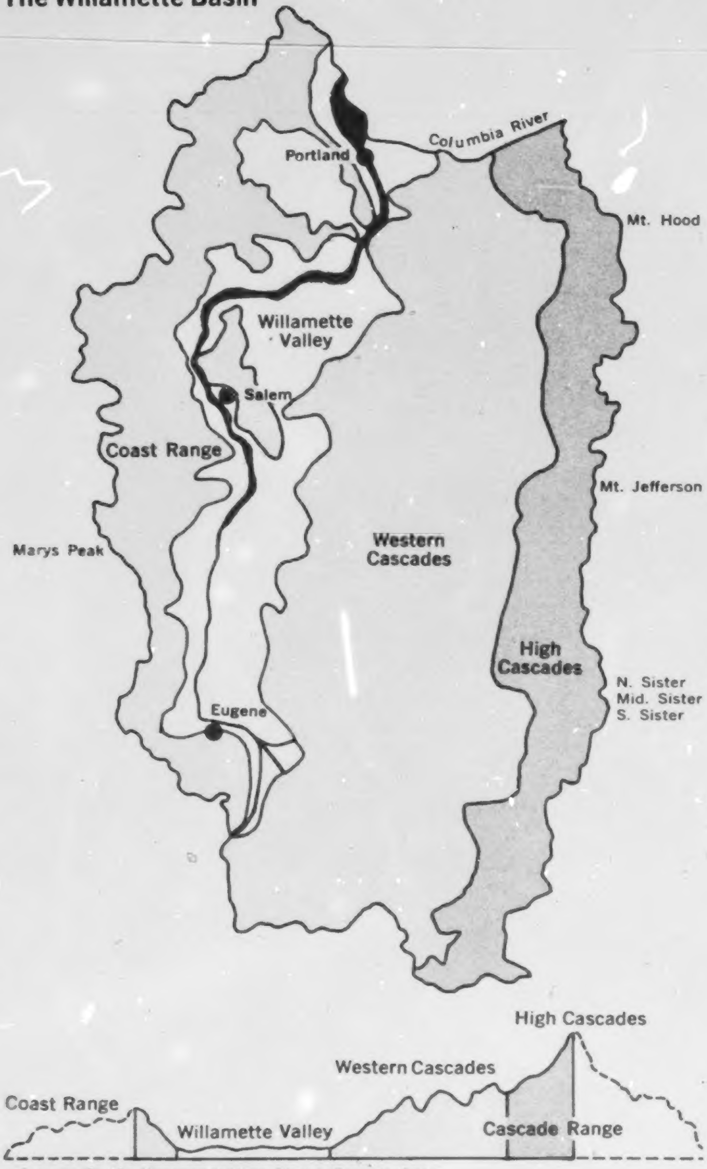
Figure 1 pictures the Willamette. The valley is approximately 150 miles long and 25 miles wide. It is bordered by mountains on both sides. On the west, peaks of the Coast Range are 2,000 to 3,000 feet high. On the east, the Cascade Mountains generally reach elevations of 5,000 feet, with five snowcapped volcanic cones that rise above 10,000 feet. At lower elevations the mountains are heavily forested, primarily with Douglas fir. Lakes, rock outcroppings, and meadows appear at the higher elevations in the Cascades. Most of the Willamette's water originates in the mountains and flows down into the river by way of its major tributaries.

The valley itself is relatively flat. The main river begins at the confluence of several tributaries at the southern part of the valley and meanders northward for 185 miles. At Oregon City, 26 miles from the Columbia, the river plunges dramatically over the 41-foot Willamette Falls. From there to the Columbia the Willamette is subject to ocean tides.

Figure 2 gives an oblique view of man's settlement along the river. Near the mouth of the Willamette and stretching along both banks as far as the Falls is the metropolitan area of Portland, with a population of 900,000. It is a major port and a center of industry and finance. Portland's suburbs stretch southward along both banks of the river as far as Willamette Falls. Salem, the State capital, with

**Figure 1**

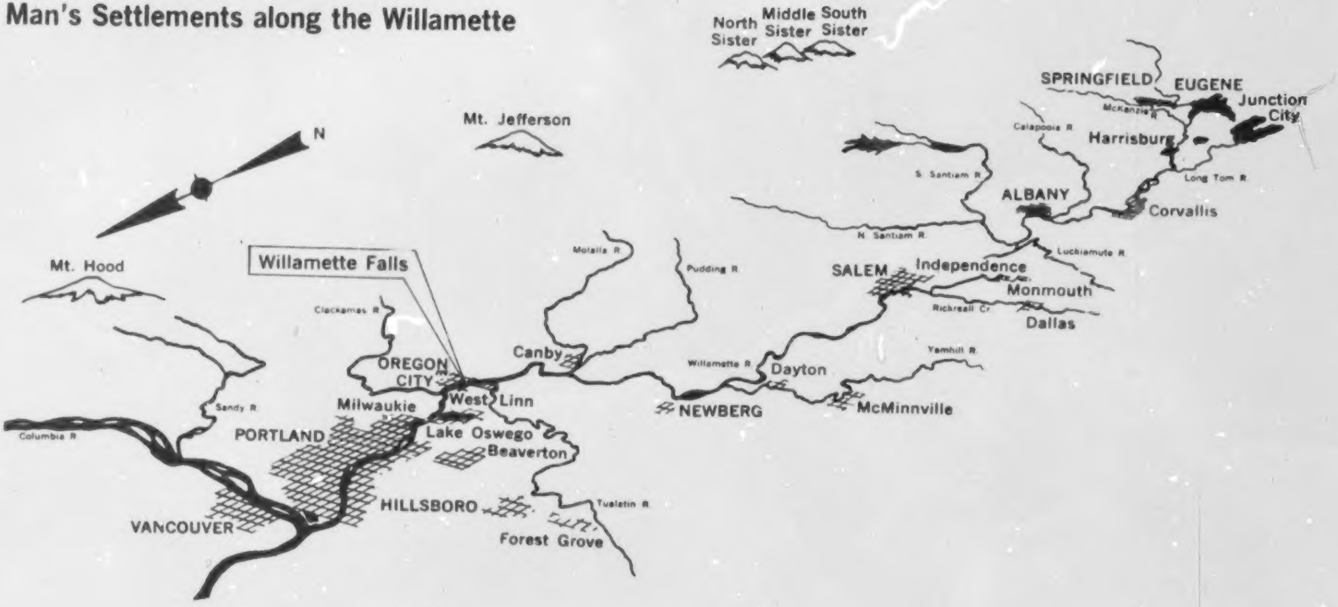
**The Willamette Basin**


Columbia River
Portland
Mt. Hood
Willamette Valley
Salem
Coast Range
Mt. Jefferson
Marys Peak
Western Cascades
High Cascades
N. Sister
Mid. Sister
S. Sister
Eugene
High Cascades
Western Cascades
Coast Range
Willamette Valley
Cascade Range

Source: Pacific Northwest River Basins Commission

Figure 2

Man's Settlements along the Willamette


North Sister
Middle Sister
South Sister
SPRINGFIELD
EUGENE
Junction City
McKenzie R
Calapooia R
Harrisburg
Mt. Jefferson
N
S. Santiam R
ALBANY
Long Tom R
Corvallis
N. Santiam R
Luckiamute R
Molalla R
Pudding R
SALEM
Independence
Monmouth
Rickreall Cr.
Dallas
Mt. Hood
Willamette Falls
Clackamas R
Yamhill R
Willamette R
Dayton
Canby
OREGON CITY
West Linn
NEWBERG
McMinnville
Milwaukie
Sandy R
Columbia R
PORTLAND
Lake Oswego
Beaverton
HILLSBORO
Tualatin R
VANCOUVER
Forest Grove

Source: Pacific Northwest River Basins Commission

a population of 75,000, lies 47 miles south of Portland. The other major communities of the Willamette Valley are Albany, Corvallis, Eugene, and Springfield.

Above the Falls, agriculture begins. The land on both sides of the river is cultivated; major crops are snapbeans, ryegrass seed, mint, hops, and strawberries. Lumbering and food processing are primary economic activities. Lumbering accounts for some 40 percent of manufacturing employment, and the food processing industry undertakes extensive canning, freezing, freezedrying and pre-preparation of foods.[2]

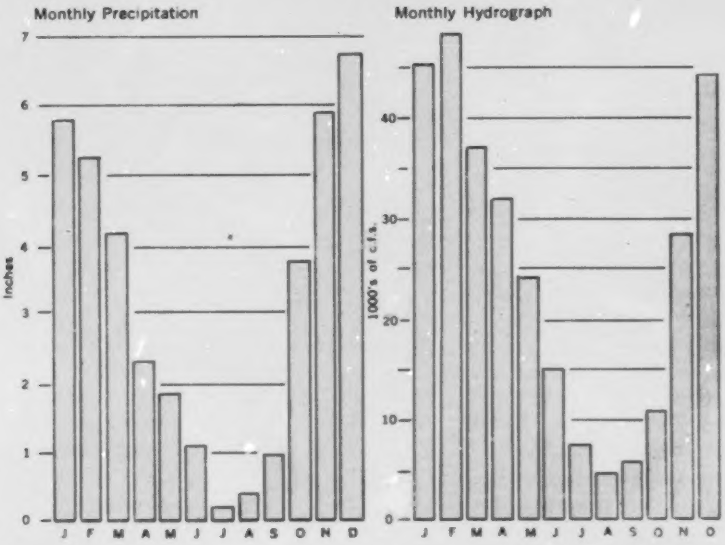
The residents of the basin constitute 70 percent of Oregon's population. During the 30 years from 1940 to 1970 the population of the basin more than doubled.

The river has always played a major role in the history of the valley. In the 19th century, steamboats were the primary means of transportation and commerce. Fish, particularly salmon and steelhead, were a source of food. By the turn of the century, Willamette Falls was harnessed to generate electric power. Sawmills used the river to transport logs and finished products. With the advent of pulp and paper mills, the river was also used to dispose of wastes.

The hydrology of the Willamette is also important in understanding its history. Variability in flow is extreme. Figure 3 shows heavy

**Figure 3**

**Precipitation and Flow at Salem**



Source: Pacific Northwest River Basins Commission

precipitation in the winter months and very little in the summer. This pattern led to extremely high water in the winter and early spring and extremely low water from July through October. Before the construction of storage reservoirs, the natural flow of the river ranged from an estimated maximum of 500,000 cubic feet per second during the flood of December 1861 to summer minimums of less than 2,500 cubic feet per second.[3] As we will see, these variations in flow were important to both pollution control and land use along the Willamette.

## Water Quality Restored

### Pollution—the Early Days

We often think of environmental degradation as a recent problem. But pollution of the Willamette was a concern as early as the 1920's. In 1926, the Oregon State Board of Health organized an "Anti-Pollution League," and in 1927 the Portland City Club was studying the pollution of the Willamette. The Club's report that year described the river as "ugly and filthy" and concluded that conditions were "intolerable." The Club also conducted a public opinion survey in which 49 percent favored legislation to control pollution, 18 percent were opposed, and 27 percent had no opinion.[4]

Several water quality surveys were undertaken in these early years. The studies concentrated on measuring the amount of dissolved oxygen (DO) in the water. Concentrations of dissolved oxygen are needed to support not only fish and plant life but also the natural biological processes by which organic wastes are converted to stable inorganic materials by bacteria and other organisms. As a general rule, DO concentrations of 5 parts per million are required if a river is to stay healthy.

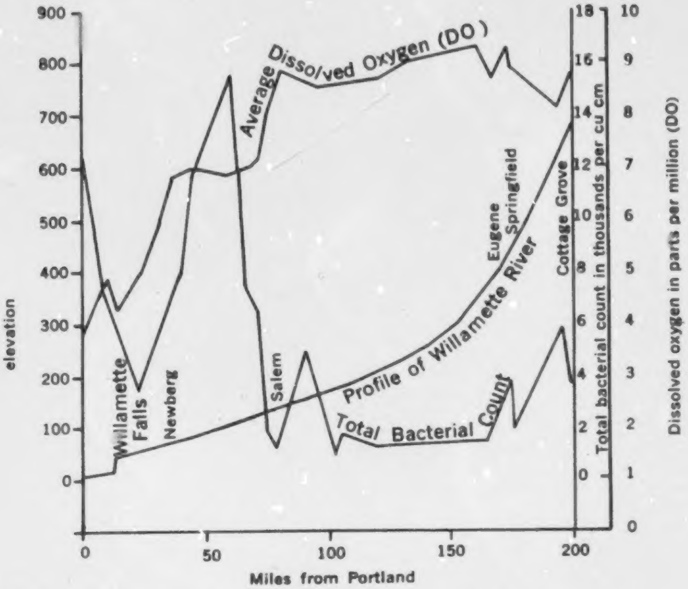
The first comprehensive water quality survey, undertaken by Oregon Agricultural College in 1929, was highly sophisticated for its time. The dissolved oxygen level was measured during the low summer flow from the headwaters to the Portland Harbor. DO was above 8 parts per million for the first 130 miles. At Salem, DO dropped to 7 parts per million and remained at that level as far as Newberg, 35 miles farther downstream. Below Newberg, water quality deteriorated seriously. DO fell below 5 parts per million 15 miles above the Willamette Falls and reached 4 parts per million at the upper end of Portland Harbor. Considering the volume of wastes entering the river at Portland, the study concluded that DO was less than 0.5 parts per million where the waters of the Willamette reached the Columbia River (see Figure 4).[5]

The 1929 study also measured total bacterial count for the length of the river. Figure 4 shows that the waters downstream of each major settlement had high bacterial counts stemming from discharges of raw sewage.

The water was polluted, first of all, because all municipalities dumped their wastes into the river without treatment. Although the Willamette was able to absorb and stabilize the discharges of smaller communities, it could not handle the municipal loads from the larger communities such as Eugene-Springfield and Salem. Of even greater consequence were the five pulp and paper mills in operation by the late 1920's. Two mills—one at Lebanon on the south Santiam tributary and one at Willamette Falls—had been constructed in the 1890's. Another plant at the Falls—on the other side of the river—was built in 1908. Two other mills, at Salem and Newberg, were constructed in the 1920's. These plants produced pulp using the sulfite process, which means cooking wood chips under pressure and then separating the larger cellulous fibers to produce paper. The residue, primarily wood sugars and smaller wood fibers, was discharged into the river. In decomposing, the wood sugars exerted an immediate and severe demand on dissolved oxygen. The wood fibers exerted their demand

**Figure 4**

**Dissolved Oxygen and Bacteria, 1929**



Source: George W. Gleason, *Return of a River* (1972), p. 16

over a more extended period. Often they formed sludge deposits on the bottom. During the low-flow summer months, the deposits frequently surfaced as unsightly, foul-smelling floating rafts. As much as 80 percent of the total demand on the dissolved oxygen in the river stemmed from the pulp and paper mills.

When these waste flows reached Portland Harbor, the water quality situation became serious. The municipal wastes of the city, which by 1930 had 300,000 inhabitants, flowed untreated into the harbor through 65 separate discharge sewers. Further, tidal action and backflows from the Columbia generally kept the wastes in the deep harbor for an extended period during the low-flow summer months. The result during the summer was often a total absence of dissolved oxygen along stretches of the harbor.

Public concern over the river's condition quickened in the 1930's. In 1933, the Governor of Oregon called the Mayors of the cities on the Willamette together for a conference "responsive to a State-wide demand for abatement of stream pollution." [6] The first technical study of the pollution generated by the pulp and paper industry followed that meeting. In 1935, a subgroup of the Oregon State Planning Board, the Stream Purification Committee, made a study of the water pollution laws. After identifying 35 separate State laws, the Committee determined that the existing statutes fostered administrative duplication and ineffectiveness, made it impossible to undertake ameliatory regulation, and provided for unacceptably severe, and therefore unenforceable, penalties. The Committee concluded that "promiscuous adoption of unrelated and uncoordinated nuisance and penal statutes . . . cannot form the basis of a concerted and direct effort to prohibit pollution of streams." [7]

## The New Law

During 1937, the energies of those concerned about water pollution were directed at the State Legislature. But a bill passed that year was vetoed by the Governor on the grounds that it would cause financial hardship to the cities and towns. Then in November 1938, through the efforts of the Izaak Walton League and other citizen groups, an initiative measure proposing the "Water Purification and Prevention of Pollution Bill" was placed on the ballot. No arguments against the bill appeared in the official State "Voters Pamphlet," and the measure passed by a margin of 3 to 1.[8]

The Act made it public policy to restore and maintain the natural purity of all public waters. It authorized establishment of water quality standards and created a 6-member State Sanitary Authority to develop a statewide control program and to enforce the new requirements. The Sanitary Authority functioned as a division of the Oregon State Board of Health.

## The First Plan

The Sanitary Authority, organized in February 1939, decided as a first priority that the cities should be required to clean up their wastes. Acting on estimates by consultants and State and Federal officials, the Authority determined that primary treatment and effluent chlorination would be sufficient to restore acceptable water quality. An important consideration in choosing this strategy, rather than one requiring higher levels of treatment, was the fact that several large multipurpose storage reservoirs were to be constructed by the Corps of Engineers on tributaries of the Willamette. These projects—authorized for flood control, hydroelectric power, irrigation, and navigation—would provide increased stream flows during the critical summer and fall months. Instead of natural low flows of 2,500 to 3,000 cubic feet per second at Salem, it was expected that a minimum flow of 6,000 cubic feet per second would be possible. The higher flows would provide a greater capacity to absorb wastes. The Authority, therefore, directed the municipalities to construct primary treatment facilities.

World War II delayed the construction program. However, in 1944 Portland took a major step forward. Under the leadership of the editor of the evening newspaper, a citizens' campaign won voter approval of a $12 million bond issue to finance construction of necessary interceptor sewers and a new primary treatment plant. As mentioned earlier, Portland's wastes had been discharged directly, without treatment, into the Willamette through 65 sewers. The plan for Portland provided for interceptor sewers to collect and carry the wastes to a new primary treatment plant. After treatment, the effluent was to be discharged into the Columbia River because its low summer flow was generally 40 times greater than the Willamette's.[9]

Following the war, construction of the municipal plants began in earnest. The first two—in Newberg and Junction City—were completed in 1949. Portland's was placed in operation in 1951, Salem's in 1952, and Eugene's in 1954. By 1957, with completion of the Harrisburg plant, all cities on the Willamette had at least primary treatment. All construction costs were borne by the municipalities themselves because no State or Federal assistance was then available.

In 1950, the Sanitary Authority, through a series of public hearings, turned its attention to the pollution generated by the pulp and paper mills. The Authority faced a difficult problem. On the one hand, significant improvement in water quality clearly depended on some form of abatement by the mills. Citizen groups, citing damage to fisheries and other recreational uses, insisted that something be done. On the other hand, there appeared to be no available technology by which the mills could reasonably reduce the oxygen demand of their wastes. Further, the industry hinted that stringent regulation might force the mills to relocate in a more hospitable state.

The Sanitary Authority adopted what it saw as a stop-gap solution. It formally ordered the five mills to halt by July 1952 all dis-

Mt. Hood stands high above Oregon's meandering Willamette River.

charges of concentrated sulfite waste effluents during the summer months of June through October. All the mills complied with the order. Three constructed storage lagoons in which their wastes were impounded during the summer months and released into the river during high-water periods. One mill at Willamette Falls was unable to find a site for an impoundment. It was granted permission to barge its wastes to the Columbia and release them into the larger river. The fifth mill changed from a calcium-base to an ammonia-base sulfite process which allowed the wastes to be concentrated by evaporation and spray drying for recovery of the solids as a saleable byproduct.[10]

In 1953 and 1954, the two largest of the Corps of Engineers dams began operating. The plan of regulation for the reservoirs behind the dams was as follows: to maintain low water levels during the winter so that space was available if floods threatened, gradually to fill the reservoirs during the spring and early summer as the snowpack melted, and gradually to release the stored water during the later summer and fall to augment the low natural flows in that season. The dams permitted a flow of between 5,000 and 6,000 cubic feet per second in the mid-1950's compared to the low flow of between 3,000 and 4,000 cubic feet per second in the 1940's.

## The Plan Reexamined

In 1957, the Sanitary Authority assessed its original plan. Three forward steps had been taken: all municipalities had adopted primary treatment, the pulp and paper mills had suspended discharges of strong wastes in the summer months, and flow regulation had nearly doubled the low-flow rate. Yet water quality was still poor; DO in Portland Harbor that summer was 1 part per million. Because of a tremendous increase in the sources of pollution since 1939—particularly a 73 percent increase in the population served by public sewer systems and a 93 percent increase in industrial waste loads—water quality in the Willamette had not improved. It was clear that higher degrees of treatment were necessary.[11] In early 1958, the Sanitary Authority initiated a new set of requirements.

First, the cities of Eugene, Salem, and Newberg were directed to install secondary treatment facilities. The growth in their populations was not the only reason. By then a major fruit and vegetable processing industry had developed whose waste discharges coincided with the low-flow summer months. For the most part, this industry depended on municipal facilities for waste treatment services, thereby significantly increasing facility requirements. At Salem, for example, 84 percent of the capacity of the secondary treatment plant ordered by the Sanitary Authority was for wastes of the food processing industry. Other communities on the Willamette faced similar situations.

Second, the city of Portland was lagging in its program to intercept discharges from its 65 outfalls. In 1959, the Sanitary Authority filed a lawsuit against the City Council—one of the few times that the Sanitary Authority went to court during the entire course of the cleanup campaign. In 1960, the voters of the city approved an increase in the monthly sewer charge sufficient to finance the completion of the interceptor project over a 5-year period.

Third, the pulp and paper mills were directed to reduce their pollution discharges sufficiently to eliminate slime growths and sludge deposits and to maintain a minimum dissolved oxygen concentration of 5 parts per million.

Fourth, in 1960, after another public hearing, all municipalities down river from Salem were directed to adopt secondary treatment.

## Further Tightening

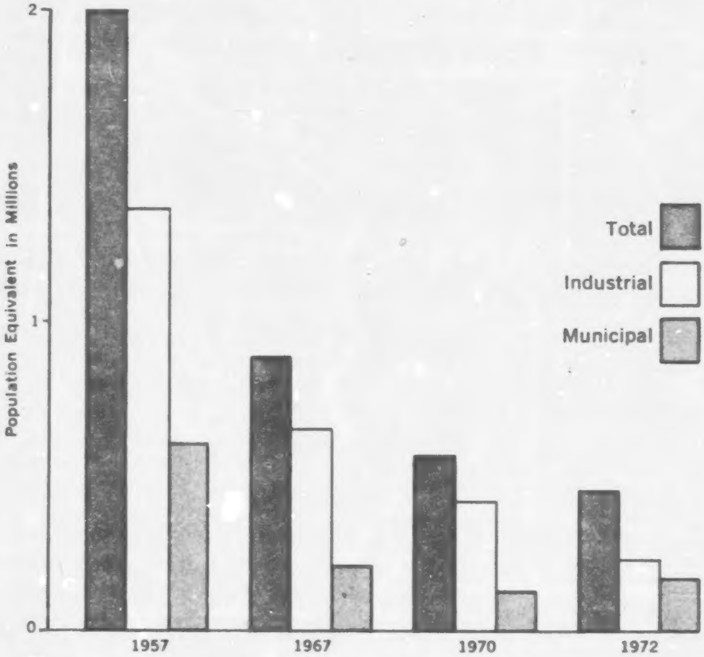
On the basis of an updated water quality evaluation, the Sanitary Authority adopted even more stringent policies in 1964. All pulp and paper mills were ordered to adopt year-round primary treatment to remove settleable solids. The sulfite mills were directed to apply secondary treatment during the low-flow summer months, providing an 85 percent reduction in oxygen demand. (In 1967, the secondary treatment requirement was extended to cover the entire year.) Secondary treatment for all other industries was also required, and the possibility of demanding still higher degrees of treatment in some cases was reserved. In short, the Board adopted a policy of universal secondary treatment, with the possibility of tertiary treatment if warranted.

This policy is still in effect today. More important, the objectives underlying it have been achieved. Secondary treatment is now universal in the Willamette Basin. The total oxygen demand of wastes has been reduced to one-fourth the 1957 level (see Figure 5). Dissolved oxygen in Portland Harbor has remained above the standard of 5 parts per million every summer since 1969 (see Figure 6).

A living sign of the new health of the Willamette is the success of the Chinook salmon entering the river in the fall. Salmon had been successfully migrating upstream in the spring even during the 1940's and 1950's, because the pollution was not a hindrance given the high water common at that time of the year. No fall Chinook salmon run had existed on the Willamette due to low summer flows at Willamette Falls. Attempts to start fall runs failed because of the extremely low DO levels in the lower river. But the situation has changed: pollution has been abated, flows are higher, and a new fish ladder has been built at the Falls. In 1965, 79 Chinooks were counted; in 1968, 4,040; in 1970, 7,460; and in 1972, 11,614.[12] The outlook is for even larger numbers.

**Figure 5**

**Reduction in Oxygen-Demanding Wastes, 1957–1972**



Source: Oregon Department of Environmental Quality, *Water Quality in Oregon* (1970), p. 18

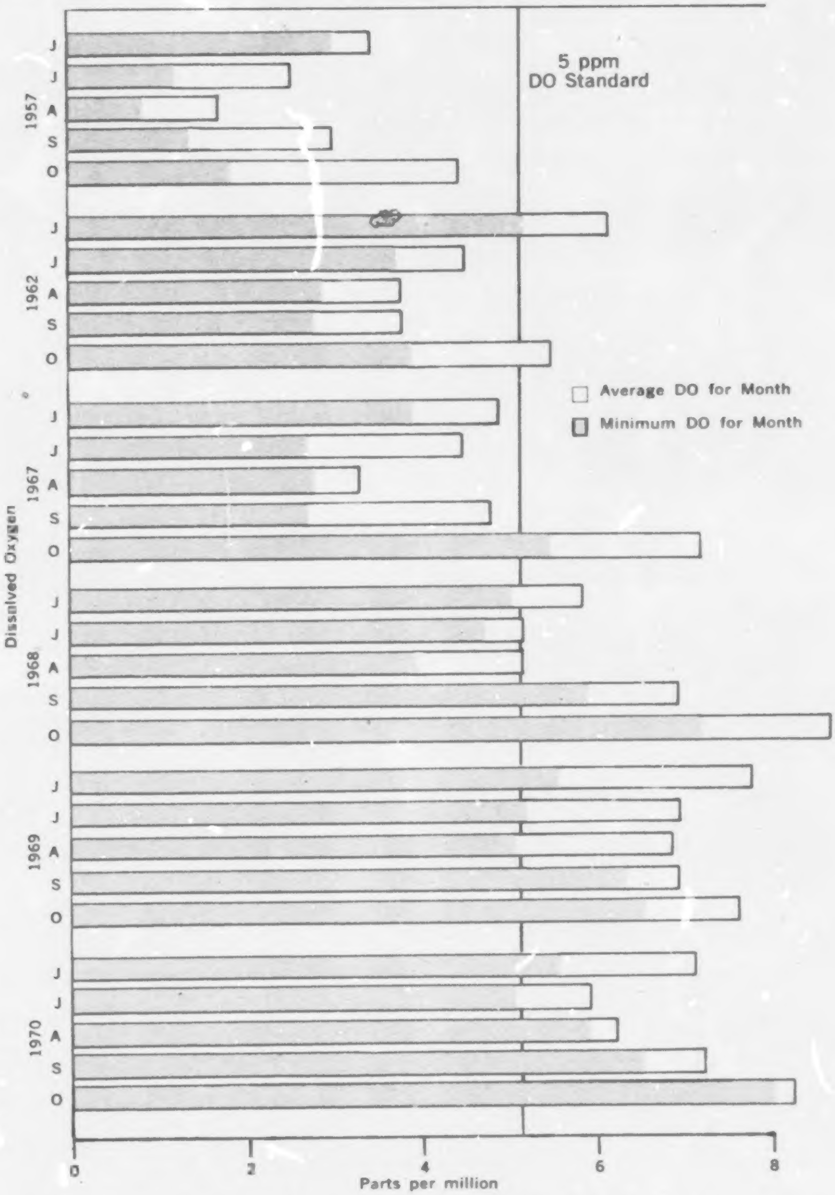
## Why Success?

What accounts for the success of the last decade? What are the elements which made it possible? A series of factors were responsible.

First, the steady progress made between 1939 and the 1960's must be recognized. The objectives which the Sanitary Authority established in 1939 on the basis of the best information available were in fact achieved by the mid-1950's. Although population and industrial growth caused water quality to remain unacceptably poor and additional steps were required, it would be wrong to conclude that the Oregon water pollution program was a failure until the 1960's. Many steps taken during that early period laid the necessary foundation on which later successes were built. The Sanitary Authority (later the Department of Environmental Quality) has continued its effective work. Under dedicated citizen and professional leadership, it has earned a reputation as an agency which "does its homework." That

Figure 6

## Dissolved Oxygen Levels, Low–Flow Months, Lower Willamette River



Source: Oregon Department of Environmental Quality, *Water Quality in Oregon* it succeeded with limited resort to the courts is noteworthy. Strong laws are a necessity if polluted water is to be cleaned up, but frequent lawsuits are not necessarily a good measure of administrative effectiveness.

No government agency can achieve its goals without popular support. Without doubt the single major factor behind the cleanup of the Willamette was the strong commitment and concern of the people of Oregon. In an environment which is largely unspoiled, the pollution of the Willamette was a highly visible outrage. As we have seen, citizen organizations worked hard for a cleaner river at all stages. In the 1920's, the Portland City Club focused attention on the river's pollution. In the late 1930's, citizens put new legislation on the ballot and got it passed. In the 1940's, citizens helped secure the bond issue in Portland. In the 1950's, sportsmen's clubs in particular insisted that the pulp and paper industry must abate its pollution. By the 1960's, the interest of specific groups broadened into a general popular concern. The people of Oregon wanted "their river" cleaned up.

The political leadership of the State both reflected and fostered this popular desire. In 1965, a legislative committee appointed to study public health needs gave considerable attention to the pollution of the Willamette. In the 1966 campaign for Governor, both candidates—State Secretary Tom McCall and State Treasurer Robert Straub—chose cleanup of the Willamette as a major theme. Four years before, while he was a television commentator, McCall had made a movie on the river called "Pollution in Paradise." Straub had a longstanding environmental record and was the first to champion the idea of the Greenway. After winning the election, McCall himself served for nearly a year as Chairman of the Sanitary Authority, signaling the determination of the State government to stop the pollution.

With broad public support, new legislation was enacted in 1967 to strengthen the antipollution effort. The new law created a mandatory waste discharge permit program. This permit authority allowed the State to set legally enforceable limitations on the amount and concentration of wastes and to establish compliance schedules for each step in the cleanup process. The 1967 legislation also provided for State aid to local governments for sewage works construction and established a system of tax credits for industrial expenditures on pollution control.[13]

The assumption by the Federal Government in 1965 of a stronger role in controlling water pollution was also very important. Legislation enacted that year required each State to establish approved water quality standards for its interstate waters and to place industry and municipalities on schedules for building treatment facilities.[14] The Willamette as far upstream as the Falls was held to be interstate. In meeting the Federal requirement, Oregon in 1967 reviewed and updated its water quality standards not only for the lower Willamette but for its other waters as well, and it was one of the first states to receive Federal approval of its standards. In the same year, the Federal Water Pollution Control Administration (the predecessor of EPA) issued a report entitled *Willamette River Basin: Water Pollution Control and Management*. The report had great influence upon public understanding of the pollution issues, particularly the contribution of the pulp and paper mills. The stronger role of the Federal Government was a spur, particularly for industry: industry had to recognize that pollution control was inevitable and that the State of Oregon could deal firmly with industry without fear that jobs would be lost to another state. The Federal Government also gave financial assistance to municipalities for their waste treatment plants. Through 1972, Federal grants to Oregon totaled $33.4 million.

A final factor in the improvement of water quality was the achievement of a higher minimum flow through releases from upstream reservoirs during the low-flow months. The original plan was to maintain a minimum flow of 6,000 cubic feet per second at Salem. Higher minimum flows proved to be achievable because of better than average runoff and a recognition of the value of water quality enhancement. The low flow of 5,300 cubic feet per second in 1968 rose to 6,500 cubic feet per second in 1969, 7,000 in 1971, and 7,500 in 1972.[15] Even more spectacular was the increase

For the first time, fishermen catch Chinook salmon near Willamette Falls in autumn.

in September minimum flows, when the Chinook salmon arrive for their fall migration. Additional waters were released to reduce temperatures, raise DO levels, and aid the fish in their travels upstream. September minimum flows increased from 5,400 cubic feet per second in 1966 to 7,000 cubic feet per second in 1968, 10,000 in 1970, and 12,000 in 1972. Maintaining water quality is not among the legislated objectives of the Corps of Engineers facilities on the Willamette. However, waters released to maintain a flow sufficient for navigation and, to a lesser degree, irrigation can improve water quality in a river with extreme fluctuations in flow. Without these additional flows, investments in treatment plants on a river such as the Willamette would not produce the same improvement in water quality.

## Outlook for the Future

The fact that the Willamette is now a healthy river is no guarantee that it will remain so. The basin's present population of 1.5 million is forecast to increase to 1.8 million in 1980, 2.4 million in 2000, and 3.6 million in 2020. This growth will mean additional wastes from both industries and municipalities.

Present policy is designed to cope with the problems of growth. Dischargers have been informed that their current daily pollution loads represent the maximum capacity of the river and may never be increased. Hence, if a paper mill expands production or if a municipality's population grows, the level of treatment will have to be upgraded to compensate.

Portions of the basin still face special pollution problems. For example, the Tualatin Valley near Portland has undergone very rapid suburban growth. The Tualatin River drains the Valley, and a portion of its flow is diverted into manmade Lake Oswego before it discharges into the Willamette. Because of this diversion and heavy use of the river's water for irrigation, the flow in the Tualatin is extremely low in the summer. Consequently, the Tualatin is not capable of carrying the wastes of the population of 175,000 without extremely high levels of treatment. To deal with the situation, in 1970 the State banned all construction until a county service district was created. The plan now in effect calls for an extensive system of interceptor sewers, one major and six minor treatment plants, and tertiary treatment. The major plant, expected to be in operation in 1975, will replace several existing smaller plants, remove 85 percent of the phosphorus, and limit the oxygen demand of the effluent to not more than 5 parts per million.[16]

Citizens continue to play an important role in maintaining water quality on the Willamette. The Department of Environmental Quality often learns of discharge violations from citizens. Equally important, the public has repeatedly indicated to State officials, in elections and in other ways, that it wants Oregon's environment preserved. This is the best guarantee that the Willamette will remain a healthy river.

## Land along the River

We may turn now to the question of land use along the Willamette River and how the benefits of improved water quality are to be enjoyed. Will the public, which has paid for the restoration of the river, enjoy it? Or will public access to the waters be blocked? In many ways, questions of land use along the water and public access to it are more difficult than the task of cleaning up pollution. Before addressing them, however, we need to understand how the present pattern of land use along the Willamette developed.

### Early Development

Land use on the shores of the Willamette has been shaped primarily by the hydrology of the river and by the needs of industry and commerce.

In the 19th century, the river was the main avenue of communication in the valley. The early trappers found the river ideal for transporting furs. Steam sternwheelers appeared in the 1850's. By the end of the Civil War, as many as 54 freight and passenger steamers were traveling between Eugene and Portland, calling at 191 steamer landings. The steamers carried agricultural produce downriver to distant markets and returned upriver with manufactured and other goods needed on the farms.[17]

Most of the wagon roads of this period, linking farm communities to the steamer landings and ferry crossings, were built to avoid the damaging effects of periodic flooding. When railroads were laid in the late 19th century, they were also located away from the riverbanks in order to avoid the floods. The highways, in turn, were built near the railroads.[18] As a result, long stretches of the river's banks are accessible only by boat or on foot. Viewed from the water, these sections of the Willamette shoreline appear as wilderness—little changed from the days of Lewis and Clark.

In urban areas like Portland, land use along the river was initially devoted to docks and shipping facilities. As manufacturing developed, it also located on the river in order to secure water and to facilitate waste disposal. The major hydroelectric power site—Willamette Falls—was occupied by a generating plant and two paper mills at the turn of the century.

Facilities on the water changed as time passed and technology changed. Wood docks and piers were replaced with steel and concrete. Various manufacturing facilities became obsolete; some were superseded by new uses; others merely deteriorated. Over the last 15 years, freeways and their geometric access ramps came to dominate much of the urban shoreline. The highways were located along the water not because of any need for a riverside location but because they could be constructed there with less disruption than along alternative routes.

With the growth of population, suburban development spread out from the population centers along and near the banks of the river. Commercial marinas and other docking facilities for pleasure craft appeared. Builders of apartments and condominiums sought sites

The Williamette flows through scenic farm lands south of Newburg.

with river views. Given the valley's projected population growth, it became clear to some that eventually a strip city would run the 120 miles from Portland to Eugene and that the pressures of this development would endanger the unspoiled tranquility of the Willamette.

## The Greenway Concept

Karl Onthank, Dean of Students at the University of Oregon and a long-time conservationist, saw these trends and worried about them. In the summer of 1966, in the midst of the gubernatorial campaign, he sent a letter to both candidates. In it he proposed the creation of the Greenway, a parkway stretching continuously down both banks of the Willamette from the Dexter Dam on the Middle Fork above Eugene to the Columbia River. It would be one of the longest parks in the world, a bit of unspoiled wilderness for camping, swimming, boating, fishing, hiking, and riding—accessible to all.

Both candidates endorsed the idea immediately, and the concept was featured in both campaigns. Right after the election, Governor McCall appointed a task force of citizens, conservationists, and State and local government representatives to define the concept and propose action. At about the same time, a group of citizens dedicated to the Greenway concept were forming a Willamette River Greenway Association to develop further public support.

The task force worked rapidly. Within 3 months legislation was submitted to the legislature. Within another 3 months, although revised in some important respects, the Greenway concept was law.

## The Greenway Plan

The objectives of the Greenway were stated in the task force report to the Governor:

> The basic objective is the preservation and enhancement of the river's natural environment while at the same time developing the widest possible recreational opportunities in a manner that injures no one and benefits all.
>
> Through imaginative yet wise planning and with the cooperation of both citizenry and government, this can be done without harm to the legitimate needs of industry or agriculture, or to local and private interests.
>
> We must be astute enough to see that preservation is far easier than correction, perceptive enough to realize that in the Willamette River we still have more to preserve than to correct, and bold enough to act accordingly.[10]

In the course of its work, the task force and other supporters of the Greenway realized that they had to live with certain realities.

They recognized that the original idea of a continuous parkland along both banks of the river was not possible. For one thing, developed urban areas were a barrier. More important, strong objections from farmers, summer homeowners, and local officials could be expected if all the land along the banks were proposed for inclusion. Therefore, the concept of a continuous parkway was replaced with a proposal for a series of intermittent parks—"a string of pearls," in the words of one conservationist.[20]

The task force also recognized that the Greenway proposal would draw opposition from the same groups if it were to be administered solely at the State level or to include the power of eminent domain. Landowners were not willing to have extensive powers placed in State hands. To be approved by the legislature, the program would have to be controlled by local government and to exclude the power to condemn land.

The task force emphasized that its goal was largely to preserve existing types of land use. Most existing land uses along the river, particularly farming, were compatible with the Greenway concept. Furthermore, much of the land was subject to flooding and was not appropriate for other forms of development.

Despite these restrictions, the proposed program was highly imaginative and broad in scope. It included: a system of river recreation camps for boaters at convenient intervals along the length of the Willamette, most of them accessible only from the river or by trail; a river access system, composed of recreation areas and boat-launching sites for picnicking and other recreational activities and for launching and retrieving boats; a Recreation Trails System for hiking, cycling, and riding; a Scenic River System to take advantage of scenic views of the river; a Recreation Tract System of special Greenway parks in varying sizes, including multipurpose regional parks—scenic areas with dramatic views of the riverscape and large tracts of undeveloped lands in the river's flood plain for wildlife preservation; and a Scenic Conservation Easement System to protect scenic qualities along the river bank without disturbing present land use.[21]

Concluding that the plan would require government control over 22,000 acres of land along the Willamette River, the task force recommended public purchase of 7,500 acres, with an estimated market value of $12 million. The task force also recommended purchasing scenic easements on 6,500 acres and recreational use easements on 1,400 acres. Most of the remaining acres were already in public ownership.

Administration of the program was to combine comprehensive planning and coordination by the State and property acquisition by local units of government. The Governor's Greenway Committee was appointed to oversee and promote the program. The Committee had three government representatives (State, county, and local) and six public members. Central administration was provided by the State

Highway Department which in Oregon is responsible for State parks. The program was to be implemented by the counties and municipalities along the river.

Under the original plan, property acquisition was to be financed 50 percent by the State and 50 percent locally. In March 1968, however, the State received an initial grant of $600,000—subsequently increased through other grants to $1.6 million—from the Land and Water Conservation Fund administered by the Department of the Interior. This changed the funding formula to 50 percent Federal, 25 percent State, and 25 percent local.

The first version of the Greenway Plan was pursued for almost 3 years. During that time, 1,310 acres of land with 6.5 miles of river frontage was purchased by local governments at a cost of $2.8 million.[22] Thirty-two parcels, averaging 41 acres each, were acquired. Progress was less than originally hoped, and some of the weaknesses of the initial program were becoming clear.

The biggest problem was the lack of funding at the local level. Although local governments enthusiastically supported the Greenway concept, most found it difficult to raise funds for land acquisition given the other demands on their budgets. Municipalities were more successful than counties in acquiring land. Although only 9 percent of the land lay within city boundaries, 64 percent of the acquisitions was by city governments. Along the rural reaches of the river, where county governments were responsible, acquisition was quite limited.

A second problem was the absence of the power of eminent domain. Depending solely on landowners' willingness to sell made it difficult to implement the plan.

Third, the expectation of the task force that considerable lands could be protected by scenic easements, either through purchase or donation, was not realized. The major problem was the cumbersome acquisition procedure required under State law. Local district attorneys were too busy with other legal problems to hold hearings and complete the other procedural requirements.[23]

## The Greenway—Recent Developments

The failings of the original version did not dishearten the proponents of the Greenway. Efforts to design a workable program continued.

In early 1971, the State government initiated a project to establish five major State parks bordering the Willamette, to be funded 50 percent by the State and 50 percent by the Land and Water Conservation Fund. (Acquisition of parklands has been funded from the State gas tax in Oregon since 1921). Including two existing parks, this project will give each county along the river a major park by 1975.

But the problem of preserving the unspoiled banks of the Willamette remained. A new program, announced by the Governor in 1972, sought to overcome the weaknesses of the original concept by placing responsibility for property acquisition and financing at the State level. Under its general legal authority to secure parklands, the State proposed to acquire 156 miles of river frontage totaling 15,700 acres. The cost, estimated at $10 million, was to be divided equally between the State and the Land and Water Conservation Fund.[24] Implementation began in 1972. The Highway Department contacted land owners to ask if they would sell. Many were willing but others were not. In several instances, appraisers suggested that the State might resort to use of its powers of eminent domain. There was an intense reaction from a group of farmers with land holdings along the river. These farmers did not want to have parts of their farms acquired by the State. They were concerned about losing access to the Willamette, particularly to draw irrigation water. They also feared that the public might litter and vandalize their property. They organized and took the issue to the legislature.

After hearings and negotiations, the legislature enacted in June new legislation which seeks to reconcile the concerns of the farmers with the need to preserve the shoreline. The objective of the new law is to sustain existing land uses along the river, particularly farming, and to prevent development damaging to natural and scenic values. Scenic easements are to be the primary regulatory tool.[25]

The law directs the Highway Commission, in cooperation with local governments, to specify within 1 year the boundaries of the Willamette River Greenway. Initially, the Greenway is to include all lands within 150 feet of the high water line on both banks of the river, but the Commission has authority to include additional lands in its final plan. The State Land Board is to review and approve the plan.

To protect the Greenway from development, the Highway Commission is authorized to acquire scenic easements within the river corridor by exercise of eminent domain as well as by purchase from willing sellers and by gift. Acquisition of a scenic easement constitutes, in effect, the purchase of certain rights to develop a property. The specific rights purchased in a particular instance can vary, from restrictions on the cutting of timber and damage to vegetation to the prohibition of buildings or other improvements. Any change in the use of lands subject to scenic easements will require the consent of the Highway Commission. The scenic easements will not expand public access. In fact, public access is expressly prohibited if the scenic easement is acquired by eminent domain. For tax purposes, lands subject to scenic easements are to be assessed on true cash value minus any reduction in value stemming from the easement.

The new law prohibits the use of the scenic easement for farm lands. However, if farm lands are to be converted to any other use, the Highway Commission is authorized to acquire a scenic easement at that time. Hence the Highway Commission will have an opportunity to protect existing farm lands if development is proposed.

Scenic easements are not the only form of control permitted under the legislation. The State or local government can continue to buy lands from willing sellers. Further, the Highway Commission is authorized to purchase public use easements, allowing the public to use lands for specific purposes such as fishing even though ownership remains in private hands.

## The Greenway—Issues

This new law has great promise. How it will work out in practice is still to be seen. Nonetheless, the history of efforts to create the Greenway illustrates many of the issues that preservation of undeveloped lands and securing public access to them are raising across the Nation.

First, who should pay for programs like the Greenway, and what role should various levels of government play? Oregon's experience shows the difficulty of relying on local financing. Local governments have not generally had significant, flexible resources with which to support such a program, although Federal revenue sharing may well change that. More important, the statewide and national benefits of such a program are a strong argument for state and Federal participation in funding. Families from other states as well as other parts of Oregon may be expected to come to the Willamette to enjoy the Greenway, probably in as great or greater numbers than those who live nearby. On the other hand, local residents have some apprehension about a program directed from the state capital. In what ways can state government guarantee local citizens that their legitimate interests will be fairly protected?

Second, will scenic and public use easements now prove as effective in Oregon as they have in other parts of the Nation? Will these easements serve to protect natural values and make present desirable land uses such as farming compatible with recreational activities of urban and suburban populations? Will easements give security to all parties, both farmers—that their vegetables will not be stolen or their irrigation pumps vandalized—and the general public—that pleasing farm land will not be developed next week or next year?

Third, is there a larger future role for land use planning and regulation in preserving lands such as the banks of the Willamette? Oregon, a State with a high level of environmental consciousness, has recently passed legislation establishing a state land use planning system (see Chapter 5).[26] Can regulation become an effective tool for maintaining the Greenway? The banks of the river are in the flood plain, subject to periodic inundation despite the Corps of Engineers facilities. Should our society permit development which, more than likely, will be damaged or destroyed in a future flood?

Finally, and most fundamentally, can our society implement expansive plans for the preservation of natural values? The original concept of the Greenway was visionary—an entire river bordered by a natural parkway. That concept has been altered to fit more modest goals. In the longer view, however, the initial vision may not be misplaced. Within 50 years, a strip city is projected to run the length of the valley. A parkway of the original scale would be an invaluable asset at that time. Delay in the present makes the future of such a park system problematic. In short, can we find ways and means to reconcile the logic of the future with the fiscal and political realities of today?

## Urban Areas

The land use issues posed by cleanup of water pollution are somewhat different in urban areas. Preservation of natural values is less relevant. Rather, the concern is how to create public access so that the public can enjoy the water. When the Willamette was virtually an open sewer, it could be cut off from the rest of the city by factories, freeways, wharves, and unsightly open lands without much loss to the public. In fact, the general development pattern in American cities was to turn away from nearby waters, be it river or estuary, and to concentrate activity at other points. But when a river becomes clean, such as the Willamette, the absence of parks, piers, restaurants, shops, marinas, promenades, and other avenues of access becomes a cause for concern, and it becomes important to transform land use on the banks from those of the past to ones more suitable today.

In the city of Portland, the importance of shifting land use in this manner is well understood by both the leadership and the citizenry. This chapter cannot comprehensively describe the plans for land use in Portland. But it can describe three examples of shifting land use aimed at improving public access to the water and assuring that the citizens who paid for the water cleanup—by their sewer bills, by State and Federal taxes, and through higher prices for goods that they consume—can now enjoy it.

The first example is the Harbor Drive, a 4-lane expressway which runs along the west bank of the Willamette for 2 miles parallel to and approximately 400 yards from the central downtown area. Built in 1941, the highway connects two bridges which cross the river.

In 1968, the future of Harbor Drive came into question, in part because a new inner loop was being planned which would feed traffic onto the bridges at either end. The Governor appointed a task force to review alternatives. Members included the Highway Commissioner, Portland's director of urban renewal, and several private citizens. Various plans to depress the Drive were developed. Then an origin and destination survey showed that most traffic on the Drive

By closing Harbor Drive (A) and possibly relocating a scrap yard (B), the people of Portland will gain access to the river.

was on its way to the other bank of the river. The primary need was for another bridge. With such a bridge, Harbor Drive would no longer be needed.

The necessary new facilities will be completed this summer. At that time, Harbor Drive will be closed. The highway itself and other lands comprising an area 4 blocks back from the river will then be available for development under State urban renewal legislation. Plans for the development are going forward. Much more than a park is intended: the planners want shops, restaurants, housing, and other facilities which will be a source of life and vitality. When the project is complete, the downtown area of Portland, rather than being cut off from the river, will be linked directly to it.

The second example has to do with a salvage yard located near the southern end of Harbor Drive, which takes apart old naval ships for scrap recovery. The Governor has cited the salvage yard as an inappropriate land use at its present site, calling it "the cancer in the breast of the Greenway."[27] Moreover, the State Department of Environmental Quality has determined that the salvage operation causes oil spills into the river. Because water pollution regulations do not allow spillage of oil, the salvage yard may soon be forced to relocate. If it does, an unsightly complex will be removed from this site near the center of the city, and an opportunity will be available to develop this section of the river bank in a way more appropriate to the site and the times.

The third example is situated another mile or two upstream. A corporation has purchased a 1-mile stretch along the river presently occupied by two old furniture factories and ragged open land. Called John's Landing, it is in the early stages of development as yet another center of vitality along the riverbank. It will be oriented to people, with housing, marinas, shops, restaurants, and other attractions. The developer has been working with local environmentalists and State Greenway officials as he develops his plan. At their suggestion, he will retain a handsome grove of willows along the water and will create a trail so that people can walk along the banks. The trail, in turn, will be linked to one of the parks acquired under the Greenway program.

## Conclusion

The story of the cleanup of the Willamette is heartening. It shows that a major river, even if heavily polluted, can be restored to health. The Willamette is a practical demonstration that treatment technology (combined in this instance with flow regulation) can remove sufficient wastes so that a large population, extensive industry, and a clean river can coexist in harmony. It indicates that the legal tools used in Oregon and now embodied in the Federal Water Pollution Control Act can induce industry and municipalities to make the necessary investment in such facilities. And it makes clear that the single most important factor is the determination of the people—and, in turn, of the government—to have clean water.

The process cannot be accomplished overnight. Cleaning up water pollution involves long and often frustrating leadtimes to plan and construct waste treatment facilities. But the country has committed itself to cleaning up the Nation's water, and the example of the Willamette demonstrates that it can be done.

Oregon's efforts to protect natural values and assure public access to the waters are still in process. The unresolved question on the Willamette—how to match controls over land use with improvements in water quality—has emerged as a major environmental issue. Over the next 10 years, the United States is expected to spend $121 billion on water pollution control. The people—as taxpayers and consumers—will pay the bill. They are entitled to the benefits, and the benefits in turn depend on decisions about the use of land along the shores. Difficult questions must be answered, questions which have been addressed on the Willamette: How much public access is needed? How much is likely to be provided by the private sector? How will publicly controlled access be secured? What will be the role of land use controls? Can current desirable land uses be preserved? Who is to pay for public access? Oregon has been grappling with all these questions. Perhaps, as in the case of water quality, the State will show the way for the rest of the Nation.

## Footnotes

1. George W. Gleeson, *The Return of a River: The Willamette River, Oregon* (1972), provides a detailed technical review. EPA's pamphlet, *Oregonians Restore the Willamette,* by Herbert E. Simison (1972) is a briefer summary. Articles in the *National Geographic* (Ethel A. Starbird, "A River Restored: Oregon's Willamette," June 1972, pp. 816–34) and in *Sunset* ("The Willamette . . . Oregon's River Parkway," July 1972, pp. 54–59) concentrate on the opportunities offered by the restored river.
2. Pacific Northwest River Basins Commission, Willamette Basin Task Force, *The Willamette Basin: Comprehensive Study of Water and Related Land Resources, Main Report* (1969), pp. 46–53.
3. G. Gleeson, *supra* note 1 at 5–7.
4. Id. pp. 12–13.
5. Id. pp. 15–16.
6. Id. p. 17.
7. Id. pp. 19–21.
8. Id. pp. 21–22.
9. Interview of Steffen W. Plehn, Council on Environmental Quality, with Kenneth H. Spies, Deputy Director, Oregon Department of Environmental Quality, in Portland, Oreg., May 2, 1973.
10. Id.
11. Kenneth H. Spies, "Water Quality Control in the Willamette River of Oregon," April 1973, pp. 6–7 (mimeograph).
12. Id. p. 9.
13. G. Gleeson, *supra* note 1 at 49–58.
14. Federal Water Pollution Control Act § 5(a), 33 U.S.C. § 466 (1965), *formerly* 70 Stat. 504 (1948).
15. Memorandum from Corps of Engineers to Council on Environmental Quality, April 30, 1973.
16. Letter to Steffen W. Plehn from Kenneth Spies, May 18, 1973.
17. George W. Churchill, "The Story of a Great River," *Parks and Recreation*, pp. 103–105, January 1972.
18. Id. p. 103.
19. *Governor Tom McCall's Willamette River Greenway Proposal,* March 1967.
20. G. Churchill, *supra* note 17 at p. 104.
21. Greenway Proposal, *supra* note 19.
22. Department of the Interior, Bureau of Outdoor Recreation, April 12, 1973.
23. Telephone conversation of Steffen W. Plehn, Council on Engironmental Quality, with George W. Churchill, Director of Willamette River Park System, June 7, 1973.
24. Department of the Interior, *supra* note 22.

25. Engrossed House Bill 2497, Oregon Legislative Assembly, 1973 Regular Session.

26. Philip Fradkin, "Oregon Makes Striking Gains in Protecting Environment," *Los Angeles Times*, April 15, 1973.

27. Conversation of Steffen W. Plehn, Council on Environmental Quality, with Larry Williams, Executive Director of the Oregon Environmental Council, in Portland, Oreg., May 2, 1973.

## CHAPTER 3

# Economics and Environmental Management

Over the past few years there has grown a general recognition of the importance of economic analysis to the development and implementation of sound environmental policies. The essence of the economists' message is that any good or service, whether a new automobile or cleaner air, costs something. There are different types of costs, and they may be borne by different people, but they must be paid.

The Nation has voted overwhelmingly for a cleaner environment. We have decided that we are no longer willing to pay the costs of dirty air, polluted water, defiled wilderness. We have realized that our environment should not and cannot serve as a dump for all our noxious wastes.

But this decision does not come free. It requires a willingness to pay instead—as consumers and taxpayers—the costs of controlling environmental insults. The decision implies higher prices, higher taxes, lower incomes, changed consumption patterns, and other adjustments. In many cases the Nation's new attitude requires a willingness to give up some of our private income for a public good—a cleaner environment.

Our decision has signaled a fundamental redirecting of our economy and society. That decision was an important one, but in many ways it was less complex than those that we now confront. For now, having decided that environmental quality is a valuable good, we have to decide more precisely how much we want, how we will pay for it, and who will pay for it. These questions often require complicated analyses involving difficult tradeoffs.

The Council's Second Annual Report explored many of these issues. Last year's Annual Report focused on how much it will cost to implement our environmental programs and what will be the economic impact on selected industries and the general economy. This year's chapter probes the relationship between economics and the shaping and implementing of environmental policy. It concentrates on three fundamental questions: First, what are the types of costs that must be identified and balanced in future environmental decisionmaking? These fall into four categories: damage costs, avoidance costs, transaction costs, and abatement costs. Second, what do we know about the magnitude of these costs? Third, who pays these costs, and how? Damage and avoidance costs affect us all, and ultimately the transaction and abatement costs are not paid by governments or businesses but by taxpayers, employees, consumers, and stockholders. All these costs are paid by people, in terms of either lower real income or lower quality of life, and they are distributed differently across different occupational groups, geographical areas, firm sizes, educational levels, and particularly different income levels.

The final section of the chapter looks at how such a consideration of costs and their incidence can contribute to the development of more efficient and effective environmental policies. It also addresses the importance of economic incentives and explores how factors such as uncertainty and irreversibility limit the application of quantitative decisionmaking.

## Damage, Avoidance, and Transaction Costs

This and the succeeding section discuss the four categories of costs that must be examined and balanced in environmental decisionmaking. *Damage* costs are those costs which directly result from a polluting activity, for example, illness and property damage stemming from air pollution. *Avoidance* costs are those that people incur in order to avoid or reduce damage costs, for example, the cost of driving farther to find an unpolluted beach. *Transaction* costs represent the resources consumed in making and enforcing policies and regulations, such as the costs of monitoring air pollution. *Abatement* costs are those associated with reducing the amount of environmental degradation, such as the cost of sewage treatment plants. Damage, avoidance, and transaction costs are discussed in this section, abatement costs in the next.

### Damage Costs

Our present high level of environmental concern grew from a recognition that pollution was damaging man and nature. The damages occur when a pollutant is not stopped at its source or successfully avoided after it has been released. Damage costs include damage to health, to vegetation, and to materials; the costs of repairing such damages; the destruction of ecosystems; and the loss of aesthetic, recreational, and other environmental amenities.

POLLUTED
UNSAFE
FOR
SWIMMING

"Unsafe for swimming" is an example of damage costs.

Many damage costs represent a loss of tangible resources—the medical care required to treat pollution-caused illness, for example, and the cost of cleaning clothes or painting houses more often. These are the costs most often estimated and reported as pollution damage costs, and they are usually measured in terms of the marketplace value of the resources destroyed or consumed.

In addition to these tangible costs, there are various intangible damage costs—the anxiety created by congestion, risks to health and safety, the aesthetic blight of a strip development, the unpleasantness of foul odors, and the annoyance of excessive noise. Often called psychic costs, they embrace the range of annoyance and other psychological costs associated with environmental degradation beyond the value of any physical resources damaged. Often they are matters of preference, and their importance is not usually measured accurately by the marketplace. The fact that these psychic costs do not consume tangible resources does not make them less important. A human want that does not directly consume a tangible resource is no less important than one that does.

Many types of environmental damage will create both tangible and intangible costs. By damaging health, air pollution affects tangible resources by causing lost production and by consuming equipment, supplies, and the time of highly skilled manpower required to restore good health. The illness, as well as the threatened loss of income security, may also arouse anxiety and fear in the individual and his family and friends. These are some of the psychic costs of air pollution—costs that are rarely included in damage estimates.

Although probably comprising a significant portion of total damage costs, psychic costs, unfortunately, cannot be accurately quantined. Further, they change over time. Opinion surveys indicate that the degree of concern about such problems as air and water pollution has increased substantially in less than a decade (see Figure 2). In the past, people were less aware of the extent and dangers of environmental degradation and had less interest in the amenities offered by a clean environment. Even as we improve our environment, the psychic costs may be higher than before because of this hightened concern.

## Avoidance Costs

Often ignored in environmental analyses, the most common method of reducing damage costs in the past was simply to avoid the pollution. One way to do this is to erect a barrier between people and pollution—building a fence to hide an ugly landscape or installing a window unit which hums to mask street noises. Coating low-voltage electrical contacts for electronic devices with gold, platinum, and other precious metals to avoid the effects of air pollution cost over $20 million in 1968, and the devices are often kept in specially air-conditioned rooms at an additional estimated annual cost of $25 million.[1]

A second way of avoiding pollution is to move away from it. If a nearby lake becomes polluted, forcing people to drive farther to swim, the extra travel costs are avoidance costs.

The damages caused by aircraft noise can be reduced by moving residential and other incompatible land uses away from airports, as is being done in Los Angeles. A study of eight other airports indicates that this kind of operation would cost between $1.3 billion and $1.6 billion per airport.[2]

There are many reasons for the rapid movement to the suburbs over the past 3 decades, for example, a desire to avoid crime or to obtain better educational opportunities. To a lesser extent, this flight also demonstrates a desire to escape the pollution, noise, and ugliness pervading many cities. The migration has cost us dearly—financially, socially, and environmentally—and these costs are partially environmental avoidance costs.

Avoidance costs are often ignored because they are generally very hard to estimate. In most cases an action is taken for several reasons, only one of which is to avoid pollution. It is difficult to know what value to assign to each reason. The window hummer and the electric switch plating examples mentioned earlier are relatively rare examples of pure avoidance costs. A clothes dryer is more typical. Clothes dryers are a convenience. The wash does not have to be carried outdoors, there is no need to wait for sunny days, and so forth. But another reason for buying a clothes dryer is to avoid the soiling of clothes dried outside. There is no way to estimate what proportion

Breathing aids to overcome emphysema aggravated by air pollution are an example of damage costs, both tangible and psychic.

of the $690 million spent on clothes dryers in 1972 was to avoid pollution and what was to buy increased convenience.[3]

## Some Cost Estimates—Damage and Avoidance Costs

Although substantial difficulties are involved in estimating damage and avoidance costs, such estimates are required for informed policy-making. We need to know both how high these costs are and how much alternative environmental policies can reduce them. Tables 1 and 2 summarize some national estimates of air pollution damage costs.[4]

The totals shown in Table 1, although significant in themselves, do not tell the whole story. They exclude a number of important costs because only a few damage cost studies have been completed. Most significantly, the table does not reflect damages to health from automobile pollutants, and it includes only one measure of the psychic costs of air pollution.[5] Table 2 contrasts the 1968 estimates with EPA estimates of damages in 1977 if air pollution had remained uncontrolled.

Similar estimates for the costs of water pollution are not available. However, Table 3 summarizes the results of several local studies, indicating how damages are distributed among different costs. Typically these estimations combine damage and avoidance costs. For instance, the damages reported from domestic and industrial use of water may be damage costs—corrosion of equipment, extra soap required, etc., or they may be avoidance costs—the cost of treating intake water to prevent damage from occurring. Similarly, the recreation costs typically include both recreation foregone, a damage cost,

**Table 1**

## Estimated National Air Pollution Damage Costs for 1968

**[In billions of dollars]**

| Type of cost | Annual cost |
|---|---|
| Damage costs | |
| Materials damage | [1] $4.8 |
| Damage to crops | [2] .1 |
| Cleaning of soiled materials | (3) |
| Damage to human health | [4] 6.1 |
| Damage to animal health | (3) |
| Reduced property values | [5] 5.2 |
| Other | (3) |
| Avoidance costs | (3) |
| **Total** | **$16.2** |

[1] Includes damages to approximately 50 materials thought most susceptible to air pollution deterioration.

[2] Includes direct visible damages affecting the yield, quality, or marketability of field crops and forests.

[3] Not estimated.

[4] Includes estimated expenditures on treatment and prevention of illnesses caused by air pollution (in excess of the primary air standards) plus income lost because of morbidity and early mortality.

[5] All housing units within SMSA's.

Source: Larry B. Barrett and Thomas E. Waddell, *The Cost of Air Pollution Damages: A Status Report* (Research Triangle Park, N.C.: Environmental Protection Agency, 1973)

**Table 2**

## Estimated National Air Pollution Damage Costs with No Pollution Control 1968 and 1977

**[In billions of dollars]**

| Damage class | [1] 1968 | [2] 1977 |
|---|---|---|
| Health | $6.1 | $9.3 |
| Residential property | 5.2 | 8.0 |
| Materials and vegetation | 4.9 | 7.6 |
| **Total** | **$16.2** | **$24.9** |

[1] In 1968 dollars.

[2] In 1970 dollars.

Sources: Larry Barrett and Thomas Waddell, *The Cost of Air Pollution Damages: A Status Report* (Research Triangle Park, N.C.: Environmental Protection Agency, 1973); Environmental Protection Agency, *The Economics of Clean Air,* Senate Document No. 92-67 (Washington: Government Printing Office, 1972)

Table 3

## Distribution of Water Pollution Costs, Selected Local Studies

[By percent]

| Beneficial use | Ohio Basin |  | Maumee Basin |  | Onondaga Lake |
|---|---|---|---|---|---|
|  | Low-medium water quality | Medium-high water quality | Low-medium water quality | Medium-high water quality | Medium-high water quality |
| Tangible costs |  |  |  |  |  |
| Municipal water treatment | 2.6 | 3.3 | 24.2 | 28.9 | 12.8 |
| Domestic use | 6.3 | 8.0 | 31.7 | 25.4 |  |
| Industrial use | 6.9 | 8.8 | 13.9 | 21.6 | 3.5 |
| Navigation | 2.2 | 2.8 | 0 | 0 | .9 |
| **Total** | **18.0** | **22.9** | **69.8** | **75.9** | **17.2** |
| Intangible costs |  |  |  |  |  |
| Recreation | 77.8 | 74.3 | 28.7 | 23.0 | 60.9 |
| Property values | 4.2 | 2.7 | 1.5 | 1.2 | 21.8 |
| **Total** | **82.0** | **77.0** | **30.2** | **24.2** | **82.7** |
| Not estimated |  |  |  |  |  |
| Ecological costs |  |  |  |  |  |
| Commercial fishing |  |  |  |  |  |
| Health effects |  |  |  |  |  |
| **Total** [1] | **100.0** | **99.9** | **100.0** | **100.1** | **99.9** |

[1] Totals may not equal 100% due to rounding.

Sources: Development Planning and Research Associates, Inc., 1973, based on information contained in the following: Ohio Basin: H. C. Bramer, "The Economic Aspects of the Water Pollution Abatement Program in the Ohio River Valley" (Doctoral Dissertation, University of Pittsburgh, 1960); Maumee Basin: Jack V. Matson, "Cost of Industrial and Municipal Water Pollution Abatement in the Maumee River Basin" (Master's Thesis, University of Toledo, 1968) Onondaga Lake; N. L. Nemerow and R. C. Faro, "Measurement of the Total Dollar Benefit of Water Pollution Control," in *Benefits of Water Quality Enhancement* (Washington: Government Printing Office, 1970, pp. 39–144 and the extra cost of participating in recreation at another site, an avoidance cost.[6] All the reported studies of water pollution costs emphasize the importance of lost recreational opportunities. A study of the Delaware River estuary estimated that recreation accounted for virtually 100 percent of the net benefits of water pollution control for water quality goals ranging from low to very high.[7] However, the relative importance of any one category varies substantially, depending upon the economic characteristics of a region, the environmental characteristics of a body of water, and the methodologies employed in a study.

## The Question of Incidence

Given our lack of data about the magnitude of damage and avoidance costs, no definitive statement can be made about how pollution affects various income groups. Data from selected cities indicate that the urban poor are subjected to somewhat higher than average pollution levels. Figure 1, based on information contained in our 1971 Annual Report, shows this relationship for three cities. A similar pattern was found in a more recent study of New York City.[8] In analyzing emissions generated throughout the metropolitan region, however, it concluded that over this broader area there are significant differences because the poor tend to be concentrated in the more highly polluted central city, and the more wealthy tend to live in the less polluted suburbs.

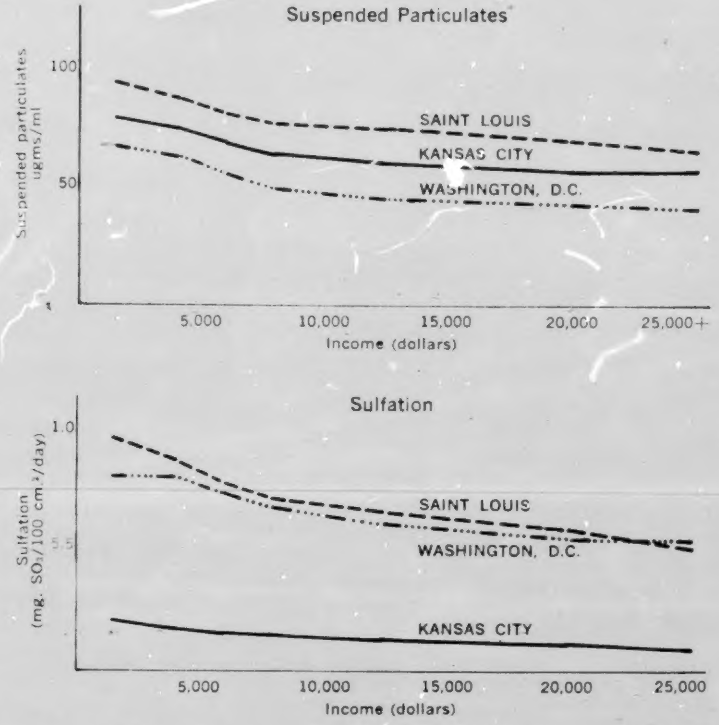
All these data refer only to ambient air pollution levels at the place of residence and thus do not take account of two important factors affecting the real incidence of the pollution. The first factor is that the more wealthy, living in their air-conditioned homes, cars, and offices, avoid some of the pollution. The second, which partially offsets the first, is that medium- and higher-income people commonly commute from their suburban homes to their jobs in the more polluted central city and therefore are exposed to more pollution than these data, which refer only to location of residence, would indicate.[9]

We must also remember that the more wealthy have to pay for their efforts to avoid pollution. Window hummers, air conditioning, and commuting from the suburbs all cost something. The wealthy may on the average be exposed to less severe pollution but at higher avoidance costs.

Other forms of environmental degradation also impact upon different income groups. Table 2 indicates that a high proportion of water pollution damage costs relates to lost recreational opportunities. Again, the wealthy may spend more to avoid these costs by substituting other recreational activities or by driving miles to swim at cleaner beaches. Realistically, the central city poor do not have the latter option. Their only alternative may be to use partially polluted waters

**Figure 1**

## Incidence of Air Pollution in Three Cities



Source: A. Myrick Freeman III, "Distribution of Environmental Quality," in Allen Kneese and Blair Bower *Environmental Quality Analysis* (Baltimore: Johns Hopkins Press, 1972), p. 265

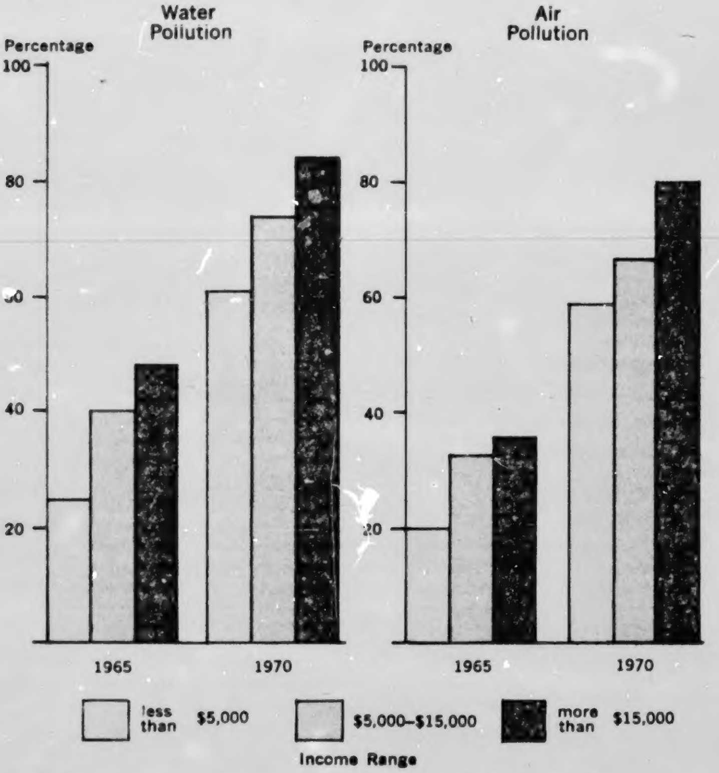
nearby or not to swim at all. Therefore, it is they who may benefit most from water pollution control.

On the other hand, the poor tend to participate less in environmentally intensive activities such as swimming, boating, and hiking.[10] This may reflect differences in preferences (there may be a high income elasticity for such activities) or differences in opportunity (because of access problems, equipment requirements, etc.). In either case, lower-income groups may benefit less from some of the programs to reduce environmental degradation. The poor have many other immediate concerns—obtaining a reasonable income, sufficient food, and adequate housing. They are likely to be relatively less concerned about such considerations as preserving wilderness areas. Nevertheless, public opinion surveys do indicate that the poor, along with everyone else, are environmentally concerned, and increasingly so (see Figure 2).

Clearly, we cannot arrive at any firm conclusions about the incidence of damage costs. The poor are apparently exposed to somewhat more serious environmental degradation but are slightly less concerned about it. They participate less in environmentally intensive activities, perhaps only because they have less opportunity.

**Figure 2**

**Environmental Concern by Income Level** [1]



[1] Responses to the question: "Compared to other parts of the country, how serious, in your opinion, do you think the problem of (air or water) pollution is in this area—very serious, somewhat serious, or not serious?" the figure gives the percentage of those responding "very serious" or "somewhat serious."

Source: Opinion Research Corporation

There is even less information about the incidence of avoidance costs, but even so, it seems safe to observe that they are borne mostly by the rich, though not necessarily in proportion to income. The rich can afford to pay these costs. The poor, having so many other basic, unfulfilled needs, cannot.

## Transaction Costs

Transaction costs are often ignored in policy analysis. They are the costs of research, development, planning, monitoring, and enforcement needed to achieve environmental goals and standards.

A large portion of Federal expenditures on environmental programs is for transaction costs (see Table 4).[11] The largest part of these expenditures is allocated to research and development required to establish environmental goals and policies.

Significant amounts are also required to monitor the air, streams, lakes, and other parts of our environment to determine pollution levels and to measure the effectiveness of our environmental policies. Emissions and effluents from factories and other point sources must also be monitored to determine if control requirements are being met. It is estimated that there are between 70,000 and 100,000 major air pollution point sources, each emitting over 25 tons of any one pollutant annually.[12] A single measurement and analysis of the emissions from one smoke stack can cost up to $5,000. Clearly, the task of monitoring these emissions is massive, even if done only intermittently. And this does not include the ambient monitoring for the 247

**Table 4**

### 1972 Federal Transaction Costs

**[In millions of dollars]**

| | Air | Water | Land | Other | Multi-media | Total |
|---|---|---|---|---|---|---|
| Research and development | 136.5 | 70.2 | 26.3 | 82.3 | 32.8 | 348.1 |
| Planning | 2.2 | 19.8 | .2 | 3.5 | 1.2 | 26.9 |
| Monitoring and surveillance | 29.0 | 30.8 | 4.4 | 18.4 | 2.0 | 84.6 |
| Administration, standard setting, enforcement | 82.2 | 72.8 | 0 | 16.6 | 27.4 | 199.0 |
| Other | 15.0 | 92.5 | 7.5 | 83.4 | 4.5 | 202.9 |
| **Total** | **264.9** | **286.1** | **38.4** | **204.2** | **67.9** | **861.5** |

Source: Office of Management and Budget, "Back-up Information for Special Analysis 'S,' Federal Environmental Programs" (unpublished report of the Office of Management and Budget, 1972) air quality control regions, the 269 river basins, and the thousands of lakes and coastal areas. Although current Federal law requires self-monitoring by polluters, substantial monitoring still must be conducted by the Government. These costs, as well as the costs of planning and administration, will have to be paid by state and local governments.

A final element of transaction costs, unreported in Table 4, is the cost of preparing environmental impact statements as required by NEPA and by several state laws (see Chapter 5, Perspectives). A proper, well-supported environmental impact statement costs both time and money to produce. But good, thoroughly analyzed decisions which intelligently and carefully balance the many conflicting values of our society are never cheap. These impact statement costs, however, are likely to be saved many times over in terms of reduced damage, avoidance, and abatement costs and possibly in reduced delays in development projects requiring public review, public hearings, or court actions.

## Abatement Costs

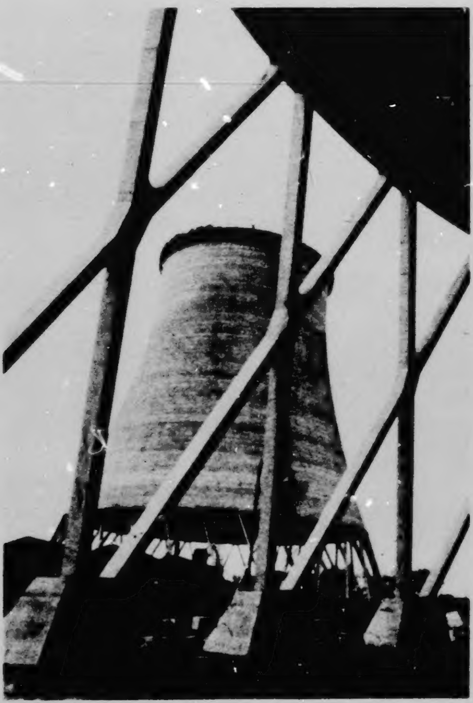
The costs of abating pollution usually dominate any discussion of environmental economics. But despite its familiarity, the term "abatement" remains imprecise, and numerical estimates often appear inconsistent or contradictory. More often than not these vagaries trace back to differences in cost definition and in underlying assumptions.

**Sampling particulates for an air pollution study is an example of transaction costs.**

Whatever the cause, the resulting confusion hampers simple comparison and sophisticated analysis alike.

A complete definition of abatement costs would include noncash costs as well as cash expenditures required to reduce discharges of contaminants. It would also cover adjustments for items such as byproduct revenues, productivity changes, financing methods, tax payments, and the like. In general, the figures cited in this section may be more accurately termed gross abatement expenditures because they do not fully or consistently take these factors into account.

Despite these shortcomings, this section assembles historical and projected abatement cost estimates in the public and private sectors for air and water pollution control, solid waste management, radiation and noise control, and strip mine reclamation. Estimates are projected abatement cost estimates in the public and private sectors and then are projected in terms of existing environmental quality goals. The final subsection assesses how these costs, ultimately appearing as higher product prices or increased taxes, are distributed across different income levels.



To abate thermal water pollution, many utilities are constructing cooling towers.

## Expenditure Trends—an Historical View

Although widespread public concern over environmental problems is recent, many sectors of the economy have for some time been spending considerable amounts on pollution abatement. Trends in these expenditures are important indicators of progress in environmental improvement. They also show the relative importance of environmental expenditures vis-à-vis other spending priorities.

**Public Sector**—Public sector spending for abatement and management activities—Federal, state, and local—has generally increased in all categories, although wide variations may be noted.

State and local spending is primarily for water pollution control (sewers and sewage treatment plants) and for solid waste collection and disposal. Expenditures for air pollution control for state and local facilities are relatively small, less than $100 million in 1971.[13] This is because of the limited number of significant emission sources, chiefly municipal solid waste incinerators but also government office buildings.

Year-by-year municipal investment for waste water collection and treatment facilities from fiscal years 1958 to 1971 is summarized in Figures 3 and 4. As Figure 3 shows, total capital spending rose from about $600 million in 1958 to over $1.7 billion by 1971. Although annual capital expenditures jumped by over 150 percent in current dollars, the increase was less than 50 percent in constant dollars.[14] Further, as Figure 4 indicates, per capita constant dollar investment changed little over the last 14 years. Several factors have caused deviations from the general trend, including changing credit market conditions and new water pollution legislation. The upturn of the last few years in part reflects new Federal enforcement actions and construction grant commitments, which often take several years to translate into construction outlays.

Environmental expenditures include not only pollution control but also recreation (maintaining, operating, and developing public parks, swimming pools, etc.) and resource conservation and development (forestry, soil and water conservation, fisheries and wildlife management). Figure 5 shows that total expenditures (including capital and operating costs) in current dollars for these categories more than doubled in 12 years, from just under $3 billion in 1958 to about $7 billion in 1970. Waste water treatment remains the largest single item, accounting for more than $3 billion or 36 percent of the annual total. Recreation is second, at slightly over 25 percent, and solid waste management and conservation and development each account for about 20 percent.

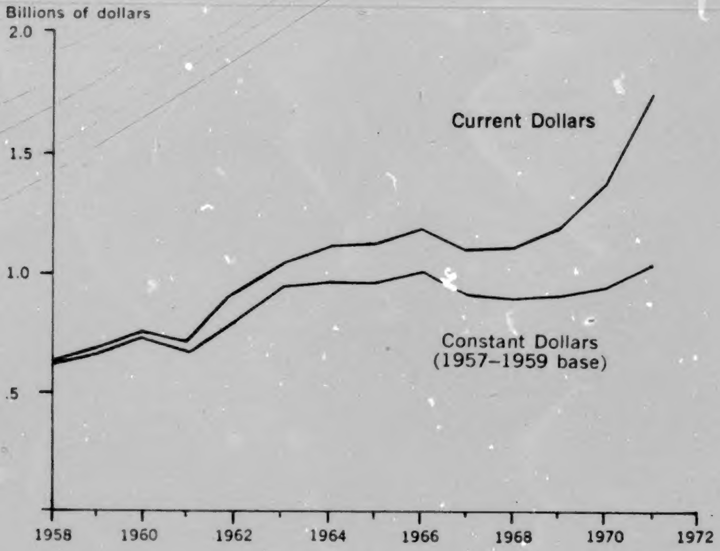
The 1971 environmental expenditures of about $7.8 billion represented approximately 5.3 percent of total state and local expenditures, down from 6.7 percent in 1958. This small drop indicates at the very least that increasing emphasis on environmental management has not yet been an overwhelming burden for state and local governments.

On the Federal level, pollution abatement spending has risen at a rapid rate over the past several years. Figure 6 shows that the outlays on pollution control and abatement activities rose at an average annual rate of 26.4 percent from fiscal year 1969 to fiscal year 1973. Construction grants to states and municipalities for waste water treatment facilities are the largest single budget item in Federal abatement spending.

**Private Sector**—The industrial sector has for many years devoted resources to pollution control, although past spending levels have been inadequate to meet present environmental standards. Unfortu-

**Figure 3**

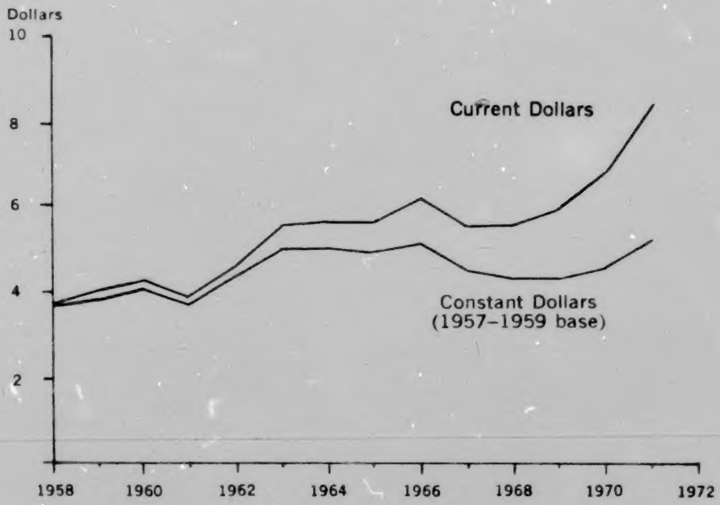
### State and Local Investment for Waste Water Collection and Treatment Facilities for 1958–1971



Source: Department of Commerce, Bureau of the Census, *Government Finances* (Washington: Government Printing Office, 1958–1970/71); constant dollars calculated with Environmental Protection Agency, Office of Water Program Operations, "Sewer Treatment Plant and Sewer Construction Cost Index" (undated and unpublished index)

**Figure 4**

### Per Capita State and Local Investment for Waste Water Collection and Treatment Facilities for 1958–1971



Source: Department of Commerce, Bureau of the Census, *Government Finances* (Washington: Government Printing Office, 1958–1970/71); constant dollars calculated with Environmental Protection Agency, Office of Water Program Operations, "Sewer Treatment Plant and Sewer Construction Cost Index" (undated and unpublished index)

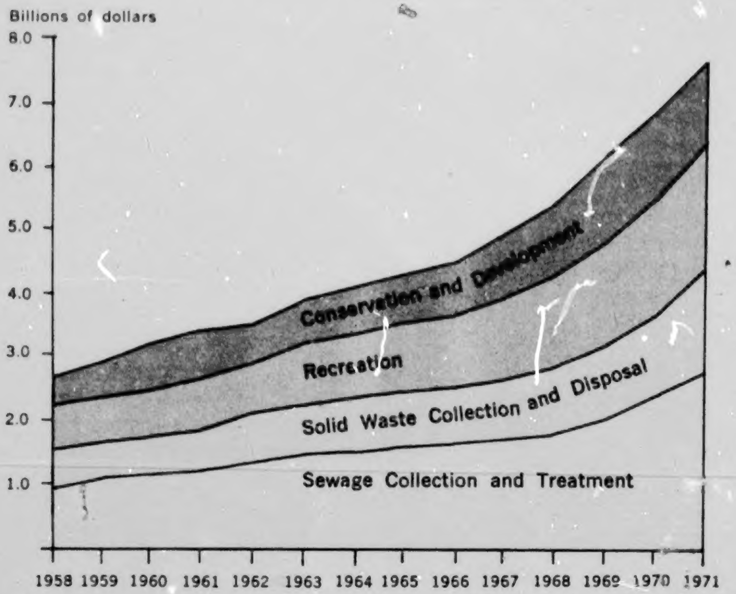
nately there is no consistent and comprehensive estimate of past investments or operating expenditures which allows us to judge progress relative to current environmental requirements.

Some information on recent private industry outlays is available through the McGraw-Hill annual survey on pollution control investment spending (see Figure 7). According to McGraw-Hill, private investment in air and water pollution control facilities has been growing at a 32.2 percent annual rate from 1967 to 1973 in current dollars, or 26.5 percent in constant dollars. Figure 8 contrasts this growth rate with the 9.4 percent growth rate for all industrial plant and equipment expenditures. Despite this upsurge, pollution control equipment will account for less than 6 percent of total investment in plant and equipment in 1973.

As Figure 7 shows, the McGraw-Hill survey found slightly higher spending for air pollution than for water pollution. During the 1970–73 period, industrial air pollution investment averaged around

**Figure 5**

**State and Municipal Expenditures for Environmental Purposes 1958–1971**



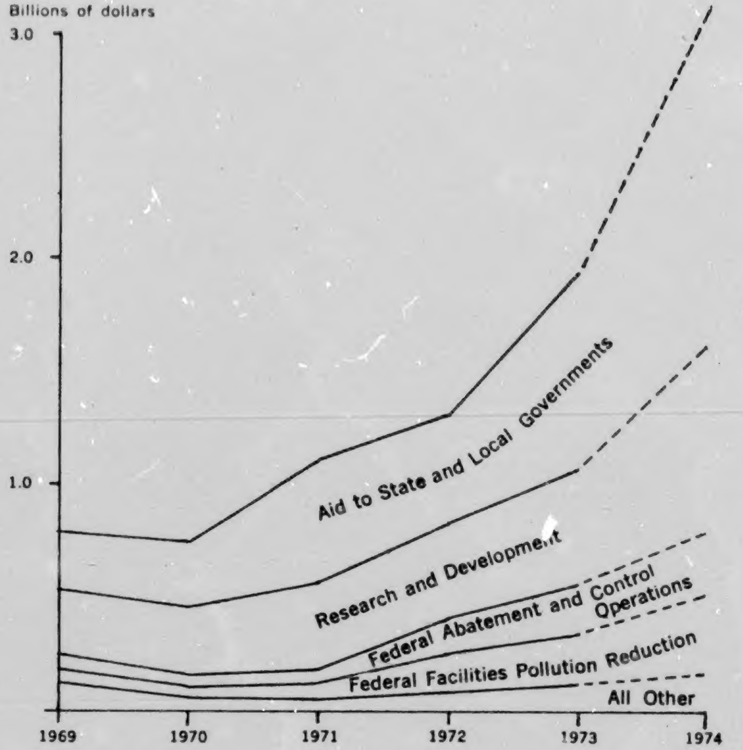
Source: Department of Commerce, Bureau of the Census, *Government Finances* (Washington: Government Printing Office, 1958–1970/71)

56 percent of the total. The latest survey shows that for the first time water pollution investment in 1973 is rising more rapidly than that for air pollution. This may be attributable in part to passage of the Federal Water Pollution Control Act Amendments of 1972.

It is likely that McGraw-Hill's reported abatement expenditures are overestimated through the inclusion of spending that is not directly related to pollution control. It is particularly difficult to pinpoint expenditures for pollution abatement in a new plant. For example, when a paper manufacturer builds a new plant using the sulfate process instead of the more water pollution-intensive sulfite process, his decision may be based primarily upon the basic economics of the process and only incidentally upon its pollution characteristics. Clearly, some part of the investment should be charged to abatement, but in practice cost allocations tend to be arbitrary. Furthermore, although decisions to change equipment and processes to curb pollution may also lead to increased productivity, all those investment

Figure 6

**Federal Pollution Abatement Outlays for Fiscal Years 1969–1973 and Estimated Fiscal Year 1974**



Source: Office of Management and Budget, *Budget of the United States Government, Special Analysis* (Washington: Government Printing Office, 1971–1974)

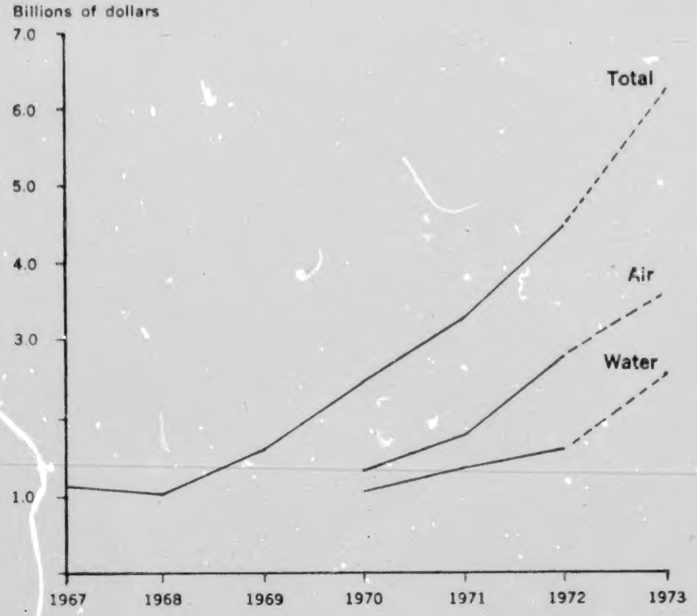
costs may be attributed to pollution control. Finally, pollution control sometimes generates byproduct revenues which may or may not be credited against the pollution control costs.

### Estimates of Future Abatement Expenditures

**Total Costs**—Past spending patterns provide some basis for evaluating future expenditure needs. Many areas of environmental concern, however, are historically uncharted. Table 5, which updates

**Figure 7**

**Industrial Pollution Control Investment for 1967–1972 and Estimated 1973**



Source: McGraw-Hill Publications Co., *Annual McGraw-Hill Survey of Pollution Control Expenditures* (New York: McGraw-Hill Publications Co., 1973)

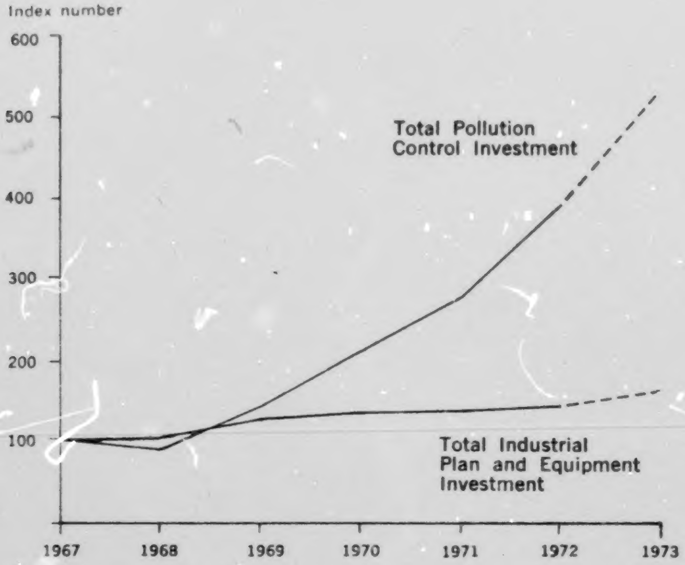
a table from the 1972 Annual Report, details a number of areas of concern. The components of Table 5 are explained below with reference to past performance whenever possible.

Last year's caveats still hold true. When possible, this year's estimates have been improved, but the data are still based on many different engineering and economic studies using differing assumptions and methodologies. Byproduct revenues, estimated equipment life, allocation of process change costs between pollution control and productivity enhancement, and numerous other factors are not dealt with uniformly.

Above all, there is much uncertainty about the cost impact of several environmental regulations that have not yet taken effect. In particular, the effect of the Federal Water Pollution Control Act Amendments of 1972 cannot yet be fully evaluated, at least partially because the Environmental Protection Agency is in the process of

Figure 8

Total Plant and Equipment Investment and Total Pollution Control Investment for 1967–1972 and Estimated 1973[1]



[1] Based on an index of 100 for 1967.

Source: McGraw-Hill Publications Co., *Annual McGraw-Hill Survey of Pollution Control Expenditures* (New York: McGraw-Hill Publications Co., 1973)

defining "best practicable technology" for treatment facilities that industry must provide by mid-1977. And although air standards are more clearly defined, the cost effects of their implementation by 1975–77 are still uncertain.

The format of Tables 5 and 6 has been altered this year, but they still convey essentially the same information. Capital investment is no longer listed for individual years and is replaced by operating and maintenance costs. This change was made for two reasons: First, capital investment requirements have been overemphasized in relation to operating costs in the past. This emphasis is not borne out by analysis. Figure 9 illustrates this point. For the three major cost categories, operating and maintenance costs run from 40 percent of cumulative total costs for water pollution abatement to nearly 70 percent for air pollution and over 90 percent for solid wastes. Indeed, after the economy passes through the initial period of heavy environ-

## Estimated Total Pollution Control Expenditures

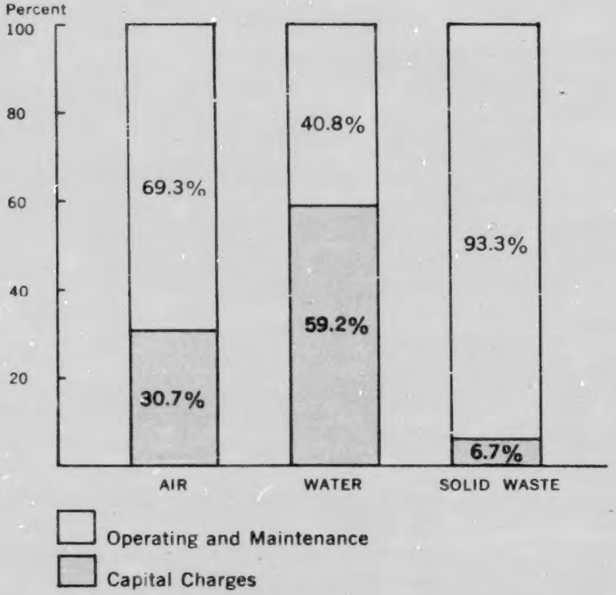
[In billions of 1972 dollars]

| Pollutant/medium | 1971 O&M [1] | 1971 Capital costs [2] | 1971 Total annual costs [3] | 1981 O&M [1] | 1981 Capital costs [2] | 1981 Total annual costs [3] | Cumulative—1972–81 Capital investment | Cumulative—1972–81 O&M [1] | Cumulative—1972–81 Total annual costs [3] |
|---|---|---|---|---|---|---|---|---|---|
| **Air pollution** | | | | | | | | | |
| Public | 0.2 | <.05 | 0.2 | 1.0 | 0.2 | 1.2 | 1.4 | 7.1 | 8.4 |
| Private | | | | | | | | | |
| Mobile [4] | 1.1 | <.05 | 1.2 | 6.2 | 4.3 | 10.5 | 27.1 | 39.1 | 58.8 |
| Stationary | .4 | .3 | .7 | 4.2 | 1.5 | 5.7 | 11.4 | 27.0 | 38.4 |
| **Total** | **1.7** | **.3** | **2.1** | **11.4** | **6.0** | **17.4** | **39.9** | **73.2** | **105.6** |
| **Water pollution** | | | | | | | | | |
| Public | | | | | | | | | |
| Federal | .2 | NA | NA | .2 | NA | NA | 1.2 | 2.8 | NA |
| State and local | 1.2 | 3.8 | 5.0 | 2.6 | 7.0 | 9.6 | 47.2 | 20.0 | 76.9 |
| Private | | | | | | | | | |
| Manufacturing | .4 | .3 | .7 | 2.2 | 1.5 | 3.7 | 12.3 | 15.8 | 27.5 |
| Utilities | .2 | .1 | .3 | 1.6 | .9 | 2.5 | 6.8 | 10.9 | 16.5 |
| Feedlots | 0 | 0 | 0 | <.05 | <.05 | <.05 | .2 | <.05 | .2 |
| Construction sediment [5] | <.05 | NA | NA | <.05 | <.05 | <.05 | .3 | <.05 | .2 |
| **Total** | **2.0** | **4.2** | **6.0** | **6.6** | **9.4** | **15.8** | **68.0** | **49.5** | **121.3** |
| **Noise** | | | | | | | | | |
| Commercial jet aircraft | NA | NA | NA | NA | NA | NA | (.4–1.6) | NA | NA |
| **Radiation** | | | | | | | | | |
| Nuclear powerplants [6] | NA | NA | NA | <.05 | .2 | .2 | 1.2 | <.05 | 1.0 |
| **Solid waste** | | | | | | | | | |
| Public | 1.0 | .2 | 1.2 | 1.7 | .4 | 2.1 | 2.6 | 13.8 | 16.3 |
| Private | 2.0 | <.05 | 2.0 | 3.1 | .1 | 3.2 | .3 | 25.2 | 25.5 |
| **Total** | **3.0** | **.2** | **3.2** | **4.8** | **.5** | **5.3** | **2.9** | **39.0** | **41.8** |
| **Land reclamation** [7] | | | | | | | | | |
| Surface mining | NA | 0 | NA | .8 | 0 | .8 | 0 | 4.5 | 4.5 |
| **Grand total** [8] | **6.7** | **4.7** | **11.3** | **23.6** | **16.1** | **39.5** | **112.0** | **166.2** | **274.2** |

[1] Operating and maintenance costs.
[2] Interest and depreciation.
[3] O&M plus capital costs.
[4] Excludes heavy-duty vehicles.
[5] Includes only sediment control for housing and highway construction.
[6] Radiation figures include incremental costs only. The total costs of radiation control are inseparable from other costs of building and operating a nuclear powerplant.
[7] Land reclamation costs are assumed to be current expenditures.
[8] Does not include noise control.

**Figure 9**

**Operating and Maintenance Costs and Capital Charges for Pollution Abatement Facilities as a Percentage of Total Costs for 1972–1981**



mental investment requirements, operating costs will probably outweigh investment even further.

Investment varies considerably from year to year in the 10-year period examined here. Single-year estimates at each end of the range are uncertain and may be very misleading. Cumulative capital investment is less susceptible to this problem and has been retained.

Most important, the final column of both summary tables—"cumulative annual costs"—differs significantly in concept from last year's final cash flow column. Both sets of figures have three elements in common: operating and maintenance costs, interest, and capital expenditures. The difference lies in the treatment of capital expenditures. Last year's figures included capital expenditures on a cash outlay basis: this year capital outlays are counted only as the investment depreciates over time. Thus the full amount of capital investment to be made in the coming decade does not show up in the final columns of Tables 5 and 6. Only the part of the investment that is depreciated during that period is included. On the other hand, last year's cumulative estimates did not count capital charges on investments made prior to 1970. The 1973 summary tables attempt to capture depreciation on past investments whenever possible. Although the definition differs from last year to this, the figures describe the same process, are nearly the same magnitude, and are roughly comparable. It should be pointed out that the final cumulative annual cost column is the sum of cumulative operating and maintenance costs (shown) and cumulative capital charges (not shown). The capital charges column which is not included is easily derived from the information presented.

**Air Pollution**—The bulk of all air pollution control outlays is private spending to control emissions from mobile and stationary sources. The relatively small public control outlays are limited to expenditures for Federal facilities and municipal expenditures for solid waste incineration. All estimates reflect the costs of meeting existing standards established under the Clean Air Act as amended in 1970. Where state standards are more stringent, costs will rise. Detailed assumptions underlying the data are found in the 1973 edition of *The Economics of Clean Air,* published by the Environmental Protection Agency. Costs for aircraft emission control have been included in the mobile source category, but these figures are small when compared to automobile controls.

The 10-year estimate of cumulative investment for stationary sources has dropped slightly from last year. The principal reason for this is a reestimation of control needs for steam electric generating plants based on state air pollution control implementation plans submitted to EPA during the past year. Investment for mobile source control is also slightly lower because of the 1-year postponement of the 1975 auto emission standards and the promulgation of interim 1975 standards. Further, estimates of control costs for meeting the 1976 nitrogen oxides standard have been revised downward. The reduction in investment is generally more than offset by higher operating costs. For mobile sources, the increased operating costs result primarily from an increase in the expected price of gasoline. For stationary sources, the increased operating costs result primarily from an increase in the expected reliance on low sulfur fuels for steam generating plants.

**Water Pollution**—This year's estimates include abatement expenditures by municipalities and industries to meet the requirements of the Federal Water Pollution Control Act Amendments of 1972 Under this law, municipalities must provide secondary sewage treatment and industry must install the "best practicable" control technology by 1977. Federal spending includes funds to upgrade Federal facilities, including naval vessels. EPA construction grants to municipalities are included under the state and local category along with municipal matching funds. These costs cover treatment plants, interceptor and collecting sewers, pumping stations, and associated outfalls. A small amount of private investment in sewers is included in the state and local total.

Estimates for municipal expenditures were derived from data supplied by the Environmental Protection Agency. These figures clearly indicate the sharp rise in municipal water quality spending that will be necessary during the remainder of the decade. The average annual expenditure for the 1972–80 period (in 1971 dollars) will be around \$7.5 billion, compared to an average of about \$2.4 billion (1971 dollars) for the past 10 years. The municipal burden, however, is lessened by the Federal construction grant program for waste treatment projects.

Estimates for industrial expenditures were taken from a recent study prepared for EPA, updating and revising previous projections.[15] This study employed improved estimation techniques and surveyed a considerably wider range of plants in each industry than had been attempted before, although several of the smaller water-using industries were not considered. These current estimates were based upon "best guess" assumptions about the technology that will be required by 1977. Because these requirements have not yet been defined, the figures presented must be regarded as preliminary.

Despite changes in technique, coverage, and standards, total expenditures for manufacturing firms have changed little from last year's estimate. The similarity in aggregate figures, however, masks significant changes in the industrial mix of expenditures. And the most recent cost estimates for public utility companies show a rather large rise. Because of the differences in estimation cited above, it is not possible at this time to isolate the cost effects of the Federal Water Pollution Control Act Amendments of 1972.

**Solid Waste**—Estimates include the collection and disposal of residential, commercial, municipal, and industrial wastes. Public sector costs include only those facilities which are owned and operated by municipalities. The private sector includes costs incurred by refuse companies and by firms disposing of their own wastes. The cost data through 1981 include adjustments for increased population and waste collection and for upgrading landfill areas.

These estimates are substantially below those reported for earlier years but are consistent with data collected by the Bureau of the Census for municipal expenditures on solid waste handling.[16] The reduction from last year is primarily attributable to reduced estimates of per capita waste generation resulting from recent EPA material balance analyses. Per unit collection and disposal costs have been increased somewhat to reflect 1972 conditions.

It should be noted that any national cost estimates for solid waste management are very uncertain because of a lack of adequate data and that aggregate costs are very sensitive to changes in per capita generation estimates. Thus, the figures presented here should be considered only tentative. Further, the reduction in these estimates does not imply that the solid waste problem is any less serious than it was previously thought to be. Many localities and regions face very different economic and environmental problems in attempting to dispose properly of their wastes, and local difficulties are not adequately reflected in national figures.

Not included in these estimates are the costs of managing agricultural and mining wastes, junk autos, and construction debris.

**Noise**—There are no comprehensive estimates of the cost of lowering noise to more acceptable levels, but preliminary estimates have been made for reducing noise from existing commercial jet aircraft. A Department of Transportation study estimates that retrofit noise control equipment could be installed for $0.4–1.6 billion.[17] Operational changes involving flight paths and scheduling may also be effective in reducing noise.

Progress on aircraft noise reduction has been slow, principally because of safety considerations, but completion of a special EPA study and proposed new aircraft noise regulations are expected shortly. At present, noise standards apply only to new aircraft (see Chapter 5, Perspectives). This cost is not added into the totals of Tables 5 and 6.

**Radiation**—In December 1970 the Atomic Energy Commission amended its earlier regulations to require that releases of radioactive material from power reactors be kept to "as low as practicable" levels although quantitative guidelines for meeting this criterion were not specified.[18] These guidelines are currently being established and will change present standards for reactor design and operation.

To meet these revised standards, additional air and water effluent controls must be installed in each plant. The incremental cost of these systems is now estimated at $1.2 billion in capital expenditures to modify both the reactors currently in operation and those to be constructed during the coming decade.

**Land Reclamation**—Half of all coal and almost all nonfuel materials are mined with surface techniques. Surface mining, if uncontrolled, disrupts wildlife, pollutes water through sediment and acid mine drainage, and leaves large areas despoiled and useless. The pending Mined Area Protection Act would establish stringent Federal performance standards for mining and reclamation activities operating under required state permits.[19] These performance standards would require restoration of mined lands to the original topography and vegetation and stabilization of soil and water conditions. They would strictly limit the dumping of spoils down hillsides and require that reclamation be carried out concurrently with mining.

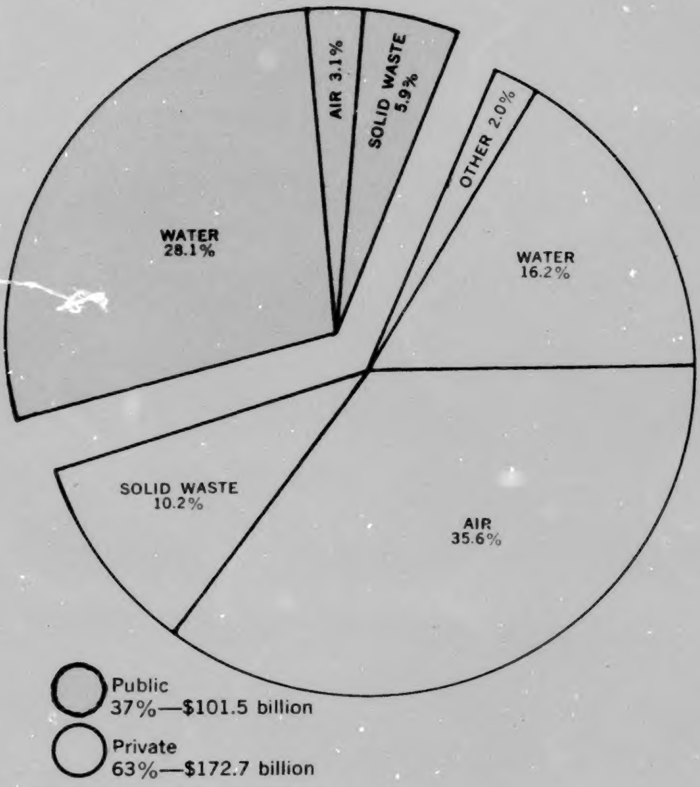
The costs presented in Table 5 are based upon estimates of $0.20 per ton of surface-mined coal for 1972–73, $0.50 per ton for 1974–81 (as reclamation is expanded), and $2,000 per acre disturbed for nonfuel surface mining.[20] There is no estimate of the cost to correct past damage. These are rough estimates at best, but the result lends perspective to the probable costs of high-quality land reclamation.

**Cumulative Costs**—As explained previously, this year's cumulative annual cost figures are roughly comparable to last year's cumulative cash flow. The $274 billion total shown in Table 5 is not substantially different from the 1972 estimate of $827 billion, especially when 1 year's inflation is taken into account. Although estimates for the major components of the total have changed substantially, the final summation is virtually the same.

Figure 10 breaks down total annual costs by sector and category.

**Figure 10**

**Distribution of Total Environmental Expenditures 1972–1981** [1]



[1] Figures do not total due to rounding.

Table 6

## Estimated Incremental Pollution Control Expenditures

[In billions of 1972 dollars]

| Pollutant/medium | 1981 | | | Cumulative—1972–81 | | |
|---|---|---|---|---|---|---|
| | O&M [1] | Annualized capital costs [2] | Total annual costs [3] | Capital investment | O&M [1] | Total annual costs [3] |
| **Air pollution** | | | | | | |
| Public | 1.0 | <0.05 | 1.0 | 1.4 | 7.1 | 8.4 |
| Private | | | | | | |
| Mobile [4] | 6.2 | 4.2 | 10.4 | 26.5 | 39.1 | 58.6 |
| Stationary | 2.5 | .8 | 3.3 | 5.4 | 15.9 | 22.8 |
| **Total** | **9.7** | **5.0** | **14.7** | **33.3** | **62.1** | **89.8** |
| **Water pollution** | | | | | | |
| Public | | | | | | |
| Federal | .2 | .1 | .3 | 1.2 | .7 | 1.1 |
| State and local | 1.3 | 1.4 | 2.7 | 16.7 | 8.5 | 18.3 |
| Private | | | | | | |
| Manufacturing | 1.2 | .8 | 2.0 | 6.2 | 10.3 | 17.8 |
| Utilities | 1.6 | .9 | 2.5 | 6.8 | 10.9 | 16.5 |
| Feedlots | <.05 | <.05 | <.05 | .2 | <.05 | .2 |
| Construction sediment [5] | <.05 | <.05 | <.05 | .3 | <.05 | .2 |
| **Total** | **4.3** | **3.2** | **7.5** | **31.4** | **30.4** | **54.1** |
| **Noise** | | | | | | |
| Commercial jet aircraft | NA | NA | NA | (.4–1.6) | NA | NA |
| **Radiation** | | | | | | |
| Nuclear powerplants | <.05 | .2 | .2 | 1.2 | <.05 | 1.0 |
| **Solid waste** | | | | | | |
| Public | .4 | .1 | .5 | .2 | 1.4 | 1.5 |
| Private | .4 | <.05 | .4 | <.05 | 1.7 | 1.8 |
| **Total** | **.8** | **.1** | **.9** | **.2** | **3.1** | **3.3** |
| **Land reclamation** | | | | | | |
| Surface mining [6] | .8 | 0 | .8 | 0 | .8 | 4.5 |
| **Grand total** [7] | **15.6** | **8.5** | **24.1** | **66.1** | **96.4** | **152.7** |

[1] Operating and maintenance costs.
[2] Interest and depreciation.
[3] O&M plus capital costs.
[4] Excludes heavy-duty vehicles.
[5] Includes only sediment control for housing and highway construction.
[6] Land reclamation costs are assumed to be current expenditures.
[7] Does not include noise control.

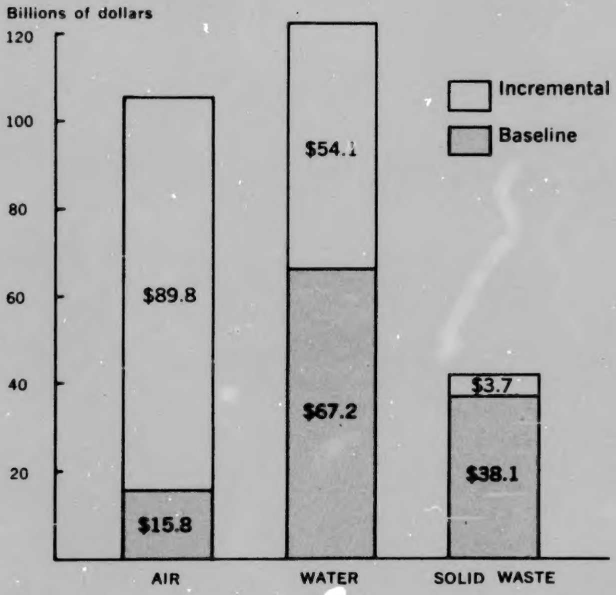
The private sector will bear nearly two-thirds of the total costs of pollution abatement over the next 10 years. Private air pollution abatement and public (municipal) water pollution abatement are the two largest single items at 36 and 28 percent, respectively.

**Incremental Costs**—Total costs are an important indication of the level of resources that the Nation devotes to preventing environmental degradation, but they do not focus on those factors of primary importance to the decisionmaker—the extra costs associated with new programs to improve environmental quality. The figures in Table 6 estimate the incremental costs of meeting new environmental quality standards through 1981.

Incremental costs are defined as any costs above those that would be incurred in the absence of recent Federal environmental initiatives. Last year the 1970 level of expenditures was used as the baseline. This year a more meaningful measure has been developed. The complexity of the baseline calculation ranges from an extrapolation of population growth and per capita waste generation in the case of solid waste to an estimate for municipal waste water

**Figure 11**

**Estimated Cumulative Baseline and Incremental Control Expenditures for 1972–1981**



treatment involving trends in per capita water usage and population served by sewage systems.[21] Subtracting these baseline estimates indicates that about 55 percent of total abatement costs expected during the coming decade is estimated to be in addition to expenditures that would have been undertaken in the absence of Federal initiatives.

The baseline change lowers the cumulative incremental investment reported, despite the effects of the Water Pollution Control Act Amendments of 1972. Although the total water pollution control investment is $28 billion higher than last year's estimate, there is no increase on an incremental basis. This is because the new definition of baseline expenditures is much higher—reflecting the fact that municipalities would invest at increasing rates even without new legislation. The relative contributions of baseline and incremental costs to the totals are shown by major cost category in Figure 11.

Figure 12 illustrates the breakdown of cumulative annual incremental costs by category. A much larger proportion of incremental than total costs accrues to the private sector: 81 percent, compared to 63 percent. And private air pollution abatement costs are by far the largest item—53 percent on an incremental basis.

## Financing Methods and Incidence

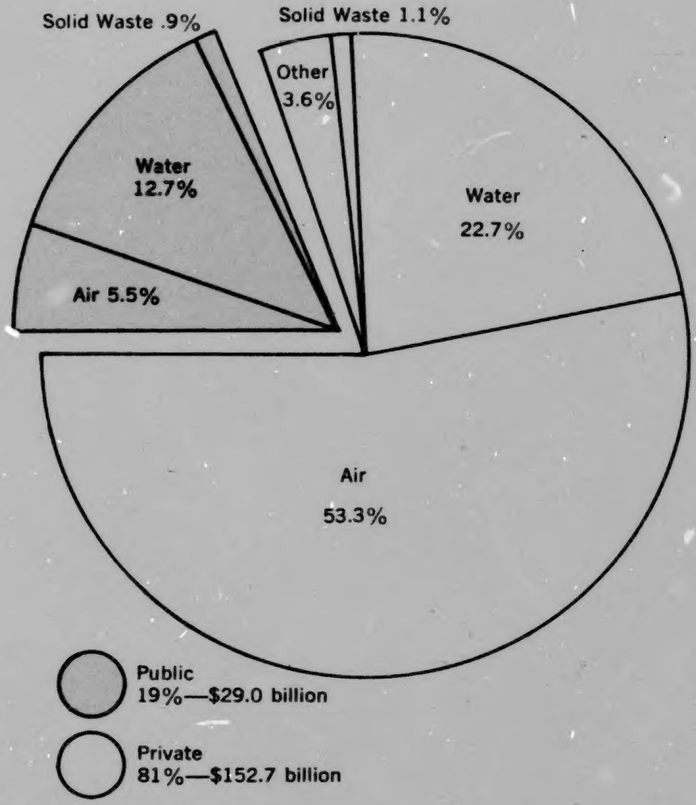
The various costs associated with environmental improvement in either the public or private sector are ultimately transferred to the public in one of five ways—through higher taxes, higher prices, lower income, changed consumption patterns, or less consumption. These financing mechanisms may have quite different implications in terms of their impact on income distribution.[22]

**Public Sector**—Most public abatement costs are financed out of general revenue taxes (either directly or through bond issues repaid out of general revenues) or through service charges for waste water and solid waste collection and disposal. How these costs are distributed among the citizenry depends upon the level of government making the expenditure and its particular tax system. The Federal Government receives most of its general revenues from personal income taxes, corporate profits taxes, and indirect business taxes (excise taxes, etc.). State governments depend more on sales, corporate profits and franchise, and income taxes. Some larger municipalities also levy sales and income taxes, but they generally rely on the property tax. Figure 13 indicates the incidence of four of these taxes by showing how $1 billion in revenues from each type of tax would affect different income levels.[23]

Local governments may also finance environmental expenditures by raising their charges for such municipal services as collecting and disposing of solid wastes and sewage. To the extent that these charges are based upon use of the services, they tend to impact lower-income

**Figure 12**

**Distribution of Cumulative Incremental Environmental Expenditures 1972–1981** [1]



[1] Figures do not total due to rounding.

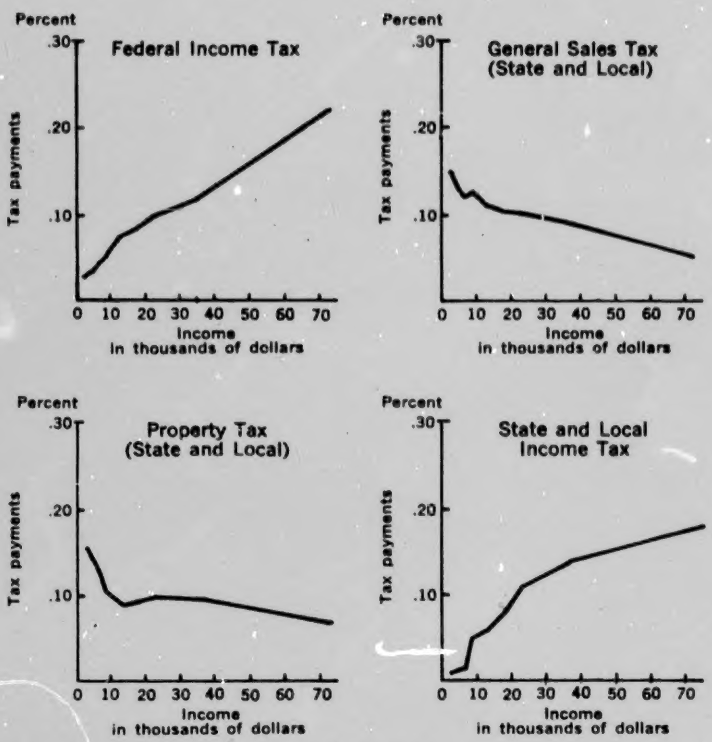
groups proportionally more than higher-income groups because the amount of such wastes generated does not vary significantly with income. Figure 14, for instance, shows the incidence of a sewer charge levied on the basis of water consumption and as a surcharge on the property tax. The incidence of the charge based on water consumption is virtually equivalent to the incidence of a head tax.

Many local expenditures are also financed by grants received from higher levels of government. These grants apply in particular to capital investments for waste water collection and treatment. Some local and state planning, administration, monitoring, and enforcement costs are subsidized by the Federal Government, and subsidies have been available for solid waste research and demonstration projects. Such Federal subsidies tend to make the distribution of the costs more progressive because Federal taxes are more progressive than most state and local taxes. However, as is discussed later, those subsidies may also tend to bias decisionmaking in such a way as to lead to inefficient abatement programs.

Finally, governments at all levels may respond to the need for increased environmental expenditures by cutting other programs or by postponing programs and expenditures that they would otherwise have undertaken. The distributional implications depend entirely upon which expenditures are reduced or postponed and how they

**Figure 13**

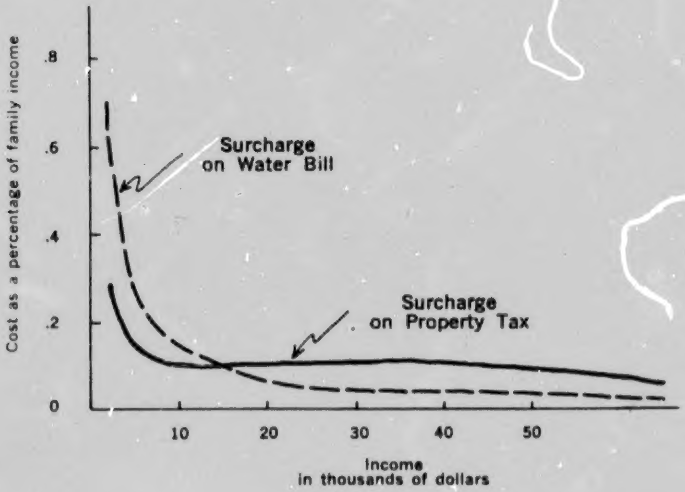
### Relative Incidence of a $1 Billion Tax Increase as a Percentage of Family Income



Source: Public Interest Economics Center, Inc.

Figure 14

Incidence of a $1 Billion Service Charge as a Percentage of Family Income for Waste Water



Source: Public Interest Economics Center, Inc.

would benefit different income classes. Because this tradeoff is rarely made explicitly, it is impossible to assess.

**Private Sector**—Most abatement costs incurred by private firms are passed on to consumers in the form of higher product prices. Previous studies by the Council on Environmental Quality, the Environmental Protection Agency, and the Department of Commerce have estimated price increases in many of the industries expected to be most heavily impacted by environmental regulations.[24] For the most part, because individual price changes are very small, it has not been possible to analyze their impact on income distribution. The two major exceptions are automobiles and electric power. The distributional effects of price rises for these commodities are shown in Figure 15. The incidence of price changes for other commodities has been assumed, in the aggregate, to be proportional to total consumption.

In some instances, private firms may temporarily finance pollution abatement by reducing their employment or by lowering profits. But these actions are so overshadowed by the state of the general economy and overall monetary and fiscal policy that it is not possible to determine their effects with any degree of accuracy.

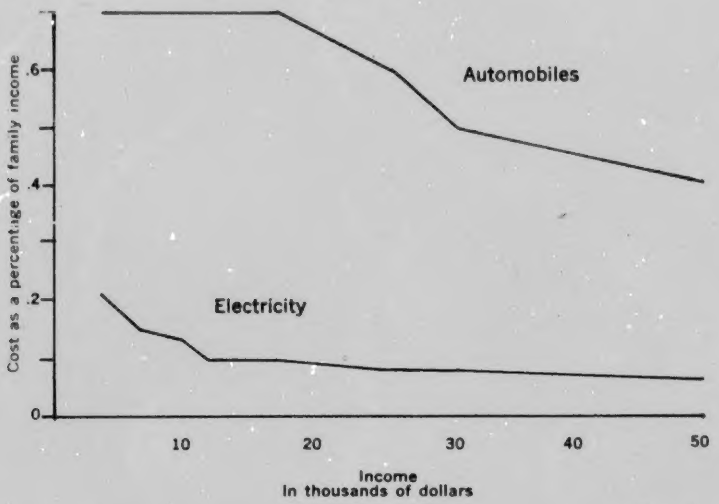
Private companies may have some of their abatement costs subsidized by different levels of government. The Federal Government allows firms to claim accelerated depreciation on pollution control equipment and facilities, which has the effect of reducing corporate profit taxes.[25] This subsidy is rarely used because it is less attractive than alternative tax deductions available to firms.[26] States and localities often exempt pollution abatement investments from property and other taxes. Table 7 lists the major state subsidies.

Private firms can reduce pollution control costs by financing abatement facilities with tax-exempt industrial revenue bonds. Issued by local governments, the bonds are used to finance the construction of pollution abatement facilities which are leased to private companies. A company then repays the interest and principal on the bond. The bonds may be sold at rates lower than normal corporate bonds because the interest payments are exempt from Federal income taxation.[27]

Use of industrial revenue bonds to finance pollution control, begun in early 1971, has grown rapidly. The total volume issued from 1971 through mid 1973 was nearly $1.5 billion.[28] Although the bonds are not a significant part of overall corporate financing, they are becoming so for pollution control equipment. During 1972 about 10 percent of air and water pollution control investment was probably financed in this manner.

**Figure 15**

**Incidence of Estimated Price Increases as a Percentage of Family Income for Automobiles and Electricity 1976**



Source: Public Interest Economics Center, Inc.

**Table 7**

## Government Subsidies for Private Pollution Control Facilities by State, May 1973 [1]

| State | Property tax exemption | Sales and use tax exemption | Corporate tax subsidies [2] | Industrial revenue financing [3] |
|---|---|---|---|---|
| Alabama | X | X | X | |
| Alaska | | | | |
| Arizona | | | X | X |
| Arkansas | | X | | |
| California | | | | X |
| Colorado | | | | |
| Connecticut | X | X | X | X |
| Delaware | | | | |
| Florida | X | | | X |
| Georgia | X | X | | X |
| Hawaii | X | X | X | |
| Idaho | X | | | |
| Illinois | | X | | X |
| Indiana | X | | | X |
| Iowa | | | | X |
| Kansas | | | | |
| Kentucky | | | | |
| Louisiana | | | | X |
| Maine | X | X | | |
| Maryland | | | | X |
| Massachusetts | X | | X | |
| Michigan | X | X | | X |
| Minnesota | X | | X | X |
| Mississippi | | | X | |
| Missouri | | X | | X |
| Montana | X | | | |
| Nebraska | | X | | |
| Nevada | X | | | |
| New Hampshire | X | | | |
| New Jersey | X | | | |
| New Mexico | | | | |
| New York | X | | X | |
| North Carolina | X | | X | X |
| North Dakota | | | | X |
| Ohio | X | X | | |
| Oklahoma | | | X | |
| Oregon [4] | X | | X | |
| Pennsylvania | | X | | X |
| Rhode Island | X | X | X | X |
| South Carolina | X | | | X |
| South Dakota | | | | |
| Tennessee | X | | | X |
| Texas | | | | |
| Utah | | X | | |
| Vermont | X | | | |
| Virginia | X | X | X | |
| Washington | | X | | X |
| West Virginia | X | X | | X |
| Wisconsin | X | | X | |
| Wyoming | X | | | |

[1] The subsidies indicated may only be available for selected types of facilities in some states.

[2] Includes rapid amortization, income tax credits, franchise tax credits, etc.

[3] Industrial revenue financing expressly authorized for private industry including utilities.

[4] Can take exemption under corporate excise, personal income, or property tax. Exemptions equal the percentage of cost allocable to current pollution control.

Sources: Tax Foundation, Inc.; Commerce Clearing House, *State Tax Guide* (Chicago); The First Boston Corporation, *Tax Exempt Pollution Control Financing* (New York, 1973)

Local governments may subsidize industry directly by providing waste collection and disposal services, particularly for waste water and solid wastes, at less than their real cost. To the extent that the financing mechanism for these services is unrelated to the amount of water generated, large waste-producing industries may be subsidized by the rest of the population.[29] It should be noted, however, that such subsidies are not permitted under the 1972 amendments to the Federal Water Pollution Control Act for facilities receiving Federal construction grants.

## The Overall Impact of Pollution Abatement

Beyond the initial cost effect of pollution abatement are the "ripples" or secondary impacts that spread into other sectors of the economy. These ripples have both negative and positive effects on total economic activity. If a worker is laid off, for example, his income falls and he consumes fewer goods and services. Thus the grocer and the appliance dealer make fewer sales, the steel manufacturer produces less, the farmer plants less corn, and so on.

On the positive side, the demand for pollution abatement equipment induces new investment and higher employment, creating higher income and more spending. Then the grocer makes more sales, the steel manufacturer produces more, and so on.

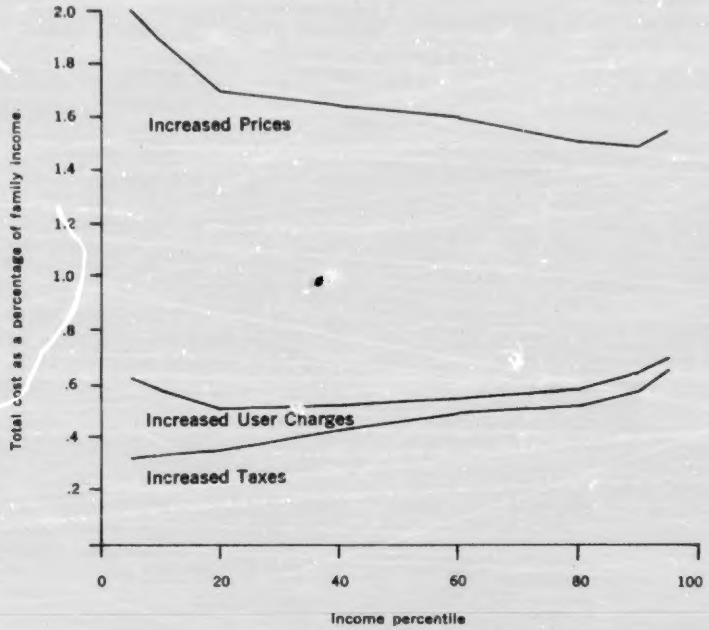
CEQ, EPA, and the Commerce Department have made several attempts to quantify the cumulative sectoral impacts of pollution control throughout the entire economy. The initial study, performed by Chase Econometric Associates and described in the Third Annual Report, showed minor overall impacts on the economy. Further analyses have supported these conclusions.[30]

We have also estimated the aggregate effect on income distribution of the anticipated 1976 incremental pollution control expenditures. The results of these analyses are presented in Figure 16.[31] The aggregate impact of government financing is predominately progressive—i.e., the wealthy pay proportionally more than the poor. The aggregate impact of private financing is somewhat regressive—the poor pay a higher proportion of their income than the wealthy. Combining public and private financing shows that in total the net incidence of all incremental expenditures is slightly regressive.

Looking only at the medium-income family (the 50th income percentile), the diagram indicates that in 1976 this family can expect to pay about 1.8 percent of its income (or somewhere in the range of $250) for the incremental costs of abating air and water pollution and for improving solid waste disposal. Approximately one-fourth of this amount will be financed by increased taxes or service charges, over one-third will represent the higher costs of owning and operating automobiles, and the remainder will represent generally higher prices for all consumption items.

Figure 16

## Incidence of Incremental Pollution Abatement Costs as a Percentage of Family Income 1976



Source: Public Interest Economics Center, Inc.

When these aggregate analyses are compared with one another and with the partial analyses presented earlier, the preliminary data indicate that the higher the proportion of costs financed by income taxes at the Federal and state levels, the more progressive will be the incidence; the higher the proportion of costs financed directly by local governments or by industry, the more regressive will be the incidence.

The distributional effects of pollution control expenditures should not be a primary determinant for selecting a particular financing scheme for environmental protection. First, these effects are small in absolute terms. Second, there are better mechanisms available to deal with income distribution problems. Third and most important, financing schemes such as user charges which place the abatement costs directly on the generators of the pollution tend to result in a more efficient allocation of resources. The total amount of pollution generated under such a scheme will be reduced because firms and individuals will have an incentive to find ways of reducing the amount of wastes that they create, and consumers will have an incentive to choose products which cause less pollution.

## Making and Implementing Policies

The preceding sections have detailed the four types of costs associated with environmental quality: damage, avoidance, transaction, and abatement costs. This section looks first at the use of these concepts in evaluating environmental policies, then at some limitations on efficient decisionmaking, and finally at the use of economic incentives in helping or hindering policy implementation.

### Economics and Policy Evaluation

Any new environmental policy can affect all four cost elements. A decision to reduce pollution will generally lead to lower damage and avoidance costs but higher transaction and abatement costs. And alternative policies and programs will generally affect each of the costs differently. In analyzing these alternatives, we seek continually to reduce damage and avoidance costs without generating greater increases in transaction and abatement costs. The goal is to identify that policy which minimizes the total of the four cost elements.[32]

Past environmental policy evaluations have tended to focus on the tradeoff between damage costs and abatement costs, usually ignoring changes in transaction and, to a lesser extent, avoidance costs.[33] As an example, Table 8 summarizes the original estimates of the damage and abatement costs associated with implementing the Clean Air Act of 1970.[34] Based on the incomplete data available, the total damage costs of air pollution in 1977 with no controls were expected to be about $25 billion. With controls, damages were estimated at $11 billion and abatement costs at $12 billion, reducing the total costs to $23 billion. It should be noted that this estimate significantly understates cost savings because the control costs include the substantial costs for controlling automobiles, but the damage costs exclude many damages resulting from the primary auto emissions ($CO$, $NO_x$, $HC$), Looking only at stationary fuel combustion sources, total costs without controls reach nearly $13 billion. With $2.5 billion of control costs, damage costs were expected to drop to $3.4 billion, reducing total costs to under $6 billion.

The tradeoff between transaction and abatement costs can also be important. The costs of delay in such capital-intensive projects as powerplants can mount rapidly when too little effort has been spent on planning and analyzing the probable environmental effects of such projects. Increased expenditures on research, monitoring, and planning can result in a less costly project which begins operating sooner.

**Table 8**

## Estimated Cost Effects of the Clean Air Act for Fiscal Year 1977

[In billions of 1970 dollars]

| Source class | Damages without controls | Damages with controls | Control costs |
|---|---|---|---|
| Mobile | [1] 2.2 | [1] 1.2 | 8.4 |
| Solid waste | .6 | .2 | .2 |
| Stationary fuel combustion | 12.8 | 3.4 | 2.5 |
| Industrial processes | 7.0 | 3.7 | 1.2 |
| Miscellaneous | 2.3 | 2.3 | 0 |
| **Total** | **24.9** | **10.8** | **12.3** |

[1] Value of health damage costs from CO, $NO_x$, and HC emissions not available due to lack of data.

Source: Environmental Protection Agency, *The Economics of Clean Air*, Senate Document No. 92-67 (Washington: Government Printing Office, 1972) pp. 1-12, 1-14

Another important consideration is that transaction and abatement costs are often borne by different sectors. For example, the private sector pays most of the costs of abating air pollution while the public sector pays most of the monitoring, enforcement, and other transaction costs. In any region there may be several alternative abatement strategies which would achieve the desired air quality. Each alternative would involve some mix of transaction and abatement costs. If the public agency responsible for selecting the alternative attempts to minimize the costs that it bears, higher private abatement costs may result and total societal costs may not be minimized.

## Limitations to Quantitative Decisionmaking

In discussing efficient decisionmaking, this chapter has touched only lightly on several problems which are yet to be solved. Two of these problems—equity considerations and irreversibilities—are dealt with briefly below. But the most serious problem is the lack of knowledge about the magnitude of the various costs, particularly damage costs. We have some estimates of the magnitude of the more easily measured damages but only the most limited data on others such as psychic costs. We have some idea about short-term toxic effects but very little about long-term chronic impacts.

Yet we must formulate and implement policies while faced by such uncertainty. Often the abatement costs of alternative policies can be estimated but the reduced damages cannot. To delay until better damage data are available may lead to more accurate decisions but may also risk increased damage during the period of inaction.

**A Comment on Equity**—Although the introduction to this chapter mentioned that the distribution of environmental costs could be analyzed in terms of many factors— educational level, geographical location, occupational group, and so on—the rest of the chapter has considered only the question of how these costs are distributed across different income levels.

The geographical distribution of these costs is clearly another important consideration, although as yet unanalyzed in detail. Should the inhabitants of the Four Corners area be subjected to higher damage costs so that the residents of Los Angeles can have cheaper electricity and cleaner air? Should East Coast fishermen bear the risk of increased oil spills so that suburban commuters can have more and cheaper gasoline? Should metropolitan area residents pay higher Federal taxes so that rural communities can have cleaner streams?

Neither these questions nor the analyses presented earlier imply that our environmental policies should be directed toward creating either income or geographical equity. Quite to the contrary, environmental programs are an unlikely and probably inefficient mechanism for pursuing such goals. Nevertheless, "equity" considerations do play an important role in most public policy decisions. There are usually several alternative ways of achieving a given goal, each of which requires a particular allocation of resources—that is, achieves the goal with a given efficiency—and each of which has a particular cost incidence. The data presented in the discussion of abatement costs, for example, indicate that the source of financing (private versus public, local government versus Federal Government) has an impact on the incidence of a given expenditure for pollution abatement. Such implications of public policies should be analyzed, for there is often room for an explicit tradeoff between efficiency and distributional considerations.[35]

**Irreversibilities**—The problem of irreversibilities is more often implicit than explicit in environmental policy analysis. The problem is how can we accurately assess the real costs created by a proposed action that will result in an irreversible commitment or destruction of a resource?

This question is meaningful in an economic context. There are two dimensions to the problem—time and cost—which can be partially substituted for one another. Some actions, such as polluting air and water (though not necessarily the damages resulting from the pollution) can be reversed relatively quickly but at significant costs. Others, such as the regeneration of a forest, require substantial time but not great amounts of money. Still others, such as strip mine reclamation, require both money and time.

On the other hand, the death of a person or species cannot be reversed. Other actions—urban sprawl, the filling of wetlands—often called irreversible, can be reversed by spending great amounts of both time and money. Buildings can be razed, the land returned to its original contours, and an acceptable, if not the original, pattern of vegetation reestablished.

The flooding of Glen Canyon is perhaps a more irreversible action. At the very least, substantial sums would be required to remove the vast amounts of silt being deposited there, and substantial time would be required for the original ecosystems to reestablish themselves, if indeed they ever would. Irreversibility has also been raised in regard to the extinction of wildlife and the development of our Nation's remaining wilderness areas.[36]

In a sense, almost every action or activity is at least partially irreversible. There is some cost involved in any reversal. And at an extreme, it is usually impossible to reproduce in exact detail every condition existing prior to an activity. However, as the term is commonly used, an irreversible situation may be defined as one in which the time or cost of satisfactory reversal is so high that it probably will not be undertaken.

Knowing where a problem arises does not indicate its importance. Many irreversible commitments are made because of basically faulty planning—the benefits to society of preserving the resource are not estimated accurately. However, under current evaluation procedures, given the necessarily limited time horizon for assessing benefits and costs, a decision to dam, to build, to cut, to fill, to pave, to mine can be justified, even though such a decision may involve an irreversible commitment which is not in our best interests over the long run.

The problem with damming a river or converting a marshland to a housing development is that society may someday wish that the resource had remained in its natural state. The point is that we do not know all the ramifications of our actions, nor do we know the value that future generations would place on a natural resource that no longer exists. The quantitative problem is almost unresolvable.

An important practical consideration is whether there are readily available close substitutes for the resources being irreversibly committed. For instance, the irreversible commitment of a small lake in Minnesota is likely to be less serious than the commitment of a similar lake in Nevada. The former has many substitutes, the latter few. Similarly, commitment of an acre of open space in the Great Plains is surely less serious than commitment of an acre of open space in the middle of a city park.

In making decisions which result in an irreversible commitment of resources, one must analyze rigorously the availability of substitutes, the cumulative effects of many small irreversible commitments, and the future value to society of resource preservation. Given our uncertainty, we should prefer actions that will not unduly restrict the range of future options.

**The Problem of Incentives**—The analysis of costs is central not only in evaluating policy alternatives but also in assuring cost-effective and timely implementation. Very often economic incentives or disincentives work against success of a policy that has been established. As a result, individuals may be encouraged to act in ways counter to the proposed policy.

Control of automobile air pollution offers an example. The Clean Air Amendments of 1970 require auto manufacturers to produce 1975 models that emit 90 percent less hydrocarbons and carbon monoxide than 1970 models and 1976 models that emit 90 percent less nitrogen oxides. A major objective of the automakers is to keep prices down so that they can sell more cars. Hence, as with almost any prohibition or similar regulation, the most attractive strategy for the auto manufacturers is to persuade the Government to reduce Federal requirements or to extend the compliance date. If the requirements stand, there is an incentive for the manufacturer to satisfy them at the least investment cost per car—even if alternative solutions involving higher investment costs but lower operating costs would result in lower total costs to the car owner.

Some of the pollution control devices being installed tend to make cars more costly to operate. The owner has an incentive to remove or otherwise to interfere with the operation of these devices if by doing so he can save money or improve the performance of his vehicle. He certainly has little incentive to see that they are maintained in proper working order. The additional air pollution that he creates will have very little impact on him. In short, he may be faced by a situation where he can reduce his abatement costs without imposing significant damage costs on himself.

Thus, the car owner may have an incentive to act in a manner inimical to attaining clear air. The manufacturer has little incentive to attempt to modify the owner's behavior. The only way to ensure that the owner will keep his emission control system in good operating condition is to pass further regulations to be enforced by costly inspection and monitoring systems. If he sees a risk of being discovered and fined, the owner will have an incentive to keep his emission control devices operating properly or at least to have them repaired before each inspection.

The scenario described will result in minimum abatement costs to manufacturers, high abatement costs for car owners, and high transaction costs for the regulating agencies. Although this strategy may reduce damage costs, it may not be the most cost-effective strategy in terms of total societal costs.

This example, related to the Clean Air Act is typical of the often perverse incentives created by regulations. The problem of appropriate incentives pervades all environmental policymaking because the different types of costs are paid by different individuals and entities. Abatement costs are usually paid by the polluter. Damage costs and avoidance costs are usually paid by the public. Transaction costs are often paid by the regulating agency. Each will attempt to minimize his own costs, and the results may not lead to the lowest total cost to society.

**Subsidies**—Economic realities generally work against encouraging a private firm or municipality to abate pollution on its own. Abatement costs are relatively high, and the benefits—reduced damage costs—are predominately experienced by others. In order to reduce these perverse incentives, various subsidy programs have been developed. They include subsidies from the Federal Government to state and local governments and from all levels of government to private firms.

Federal grants to state and local governments are primarily for construction of water pollution control facilities. Figure 17 shows (in current dollars) trends in local expenditures, Federal grant obligations, and Federal grant outlays for water pollution abatement facilities. The local expenditure data include both federally subsidized expenditures (treatment plants and sewers) and nonsubsidized expenditures (operating costs, nonsubsidized sewers, etc.).

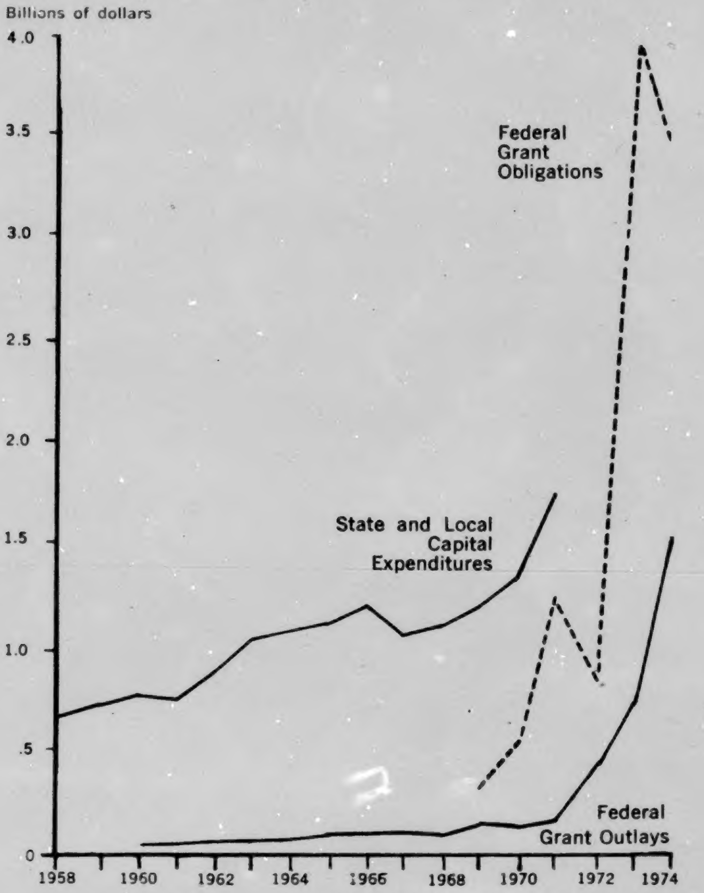
These data indicate several relationships. First, in absolute terms, state and local expenditures were rising rapidly prior to a significant Federal grant program. Enactment of a major Federal water pollution control grant program in 1965 probably delayed some construction as municipalities waited for Federal grants. This postponement in conjunction with a municipal credit crunch resulted in the 1967–68 slump in state and local expenditures. Expenditures have begun to increase since this slump, stimulated by the accelerating Federal commitment and by stricter Federal regulations. This trend will become more pronounced as Federal grants, which are already obligated, are translated into expenditures during the mid-1970's.

Although Federal grants may stimulate greater total investment, they may also bias decisions against selection of systems with the lowest total cost. Construction grants, as the name implies, are retricted to capital investments and thus encourage the choice of capital-intensive abatement measures. As a result, a municipality may find it cheaper to build new treatment capacity than to increase the level of treatment and thus the cost of operating its current plant by adding personnel or by using supplemental chemicals.

Subsidies to the private sector—accelerated depreciation, industrial revenue bonds, and sales and property tax exemptions—also apply only to capital investments and thus bias decisionmaking away from process changes and other abatement measures which may have a relatively higher ratio of operating to capital costs but lower overall

**Figure 17**

**Federal Grants for Municipal Water Pollution Control and Total Capital Expenditures by Municipalities for Fiscal Years 1956–1972 and Estimated Fiscal Years 1972–1974**



Source: Department of Commerce, Bureau of the Census, *Government Finances* (Washington: 1958–1970/71); Office of Management and Budget, *Special Analyses: Budget of the United States Government* (Washington: 1970–1974)

costs. However, because the subsidies to private firms are less than those to municipalities, the strength of this bias is less.

One final observation may be made about subsidies such as the accelerated depreciation option which, if it is at all effective, operates by reducing the effective tax rate on a company's profits. If there are no profits, there is no subsidy. Often such a subsidy is rationalized on the basis of its assisting small firms or old plants with low profit margins. But these are the entities that will be helped least by a subsidy tied to taxes on profits.

On the other hand, industrial revenue bonds do decrease the cost of investment to a firm, and the property tax exemption allows a firm to avoid an obligation that it would have regardless of its profit situation. It should be noted that because local property taxes are deductible from federally taxable income, the net subsidy to a private firm is about half the total amount of the revenue given up by the community providing the tax exemption. Similarly, the net incentive to a private firm from industrial revenue bonds is less than the revenue loss to the Treasury because of the exemption of the interest on such bonds from the Federal income tax.

## Summary

This chapter has explored the relationships between economics and environmental quality. There are many types of costs associated with a degraded environment and with programs undertaken to improve it. The cost of a degraded environment is measured in damages to health, vegetation, materials, and other values or in the costs that we incur to avoid these damages. Remedial action also has costs—costs of abatement and transaction costs for monitoring and for enforcement.

The magnitude of these costs, their impact, and their distribution are critical to evaluating environmental policy alternatives and to developing strategies for their timely implementation.

It is clear that our national commitment to a cleaner environment will be very costly—about $275 billion during the next decade. It will total about 2.5 percent of our gross national product during this period, but any lower level of expenditures would likely result in even greater economic penalties as reflected in adverse health effects or lost recreational and aesthetic values. Ultimately, a healthy ecosystem is the basis for a healthy economy.

While the benefits of a cleaner environment justify the costs which must necessarily be incurred, there are other economic effects which must also be weighed.

This year's preliminary assessment indicates that, given current financing mechanisms, the distribution of control costs tends to fall slightly more heavily on lower-income families. At the same time, however, it should be noted that damages from unabated pollution are probably also regressive. Although the incidence of abatement costs is somewhat regressive, the aggregate effect is small. Further, the financing mechanisms which contribute to this regressivity—user charges and higher product prices—will likely bring about a more efficient allocation of national resources.

The quantification of all types of environmental costs is critical to environmental policy development and implementation. As pointed out in the last section of this chapter, the problem is more difficult than just minimizing total costs to society. Although this goal is important, there are several other important factors which are difficult if not impossible to include quantitatively. First, many actions may result in the irreversible commitment of resources. What is the value of a wild river that is dammed? Its value to future generations is unknown—as are the cost and time required to try to duplicate its unique characteristics. Also important but difficult to include in any mathematical equation is the equity of environmental decisions. Although benefits may exceed costs of any given action, very different people will usually bear each cost. It is not easy to weigh the damages of pollution from power generation in one area against the benefits of the energy to another area.

Finally, economic costs can affect the implementation of environmental policies. Because damage, avoidance, transaction, and abatement costs all fall on different sectors, policies must be designed with reinforcing rather than opposing incentives. Apparently sound environmental policies often result in incentives which act against achievement of the environmental objectives. Hence economic analysis must be used not only for selecting cost-effective policies but also for ensuring that incentives are appropriate to their achievement.

## Footnotes

1. Robert C. Robbins, April 1970, "Inquiry into the Economic Effects of Air Polution on Electrical Contacts," prepared by Stanford Research Institute for the Department of Health, Education, and Welfare, National Air Pollution Control Administration, under contract No. PH–22–68–35 (available from NTIS, order No. PB 192 478).
2. Black and Sterling, Inc., August 1971, "Cost Estimates for Removal of Residential and Related Land Uses Near Selected Airports," prepared for the Aviation Advisory Commission (available from NTIS, order No. PB 215 612).
3. "1973 Statistical and Marketing Report," *Merchandising Week,* Feb. 26, 1973, p. 27.
4. Although primarily of damage costs, these estimates do include slight elements of avoidance costs under various categories. The estimates given in Table 4 are currently being updated to 1970 by Thomas E. Waddell of the Environmental Protection Agency. These revised estimates will reflect both the information which has become available since the earlier study was completed and the lower pollution levels experienced in 1970.
5. The estimate for reduced property values partially measures psychic costs but also includes such damage costs as the effect on property values of having to clean and paint a house more frequently, of being unable to grow healthy ornamental plants, etc.

6. The costs to navigation are usually damage costs because these estimates represent ship corrosion and more frequent maintenance. The property value estimates may involve some double counting of recreational costs but otherwise represent the psychic costs associated with living next to a polluted body of water.
7. Department of the Interior, Federal Water Pollution Control Administration, "Delaware Estuary Comprehensive Study: Preliminary Report and Findings," July 1966, Ch. 6.
8. Jeffrey M. Zupan, November 1972, "The Distribution of Air Quality in the New York Region," unpublished study conducted by the Regional Plan Association, New York, under a grant from Resources for the Future, Inc., p. 25.
9. Another qualifying consideration is the fact that a lower proportion of poor than nonpoor live in metropolitan areas. Forty-nine percent of poverty family members 14 years and older live in nonmetropolitan areas in the United States compared to only 30 percent nonpoverty family members. U.S. Bureau of the Census, Census of Population 1970, Subject Reports, Final Report PC(2)–8A, *Sources and Structure of Family Income* (Washington, D.C.: U.S. Government Printing Office, 1973), Table 8. Because rural areas generally experience lower levels of air pollution than urban areas, the "average" poor person would be relatively better off than the above comparisons indicate.
10. A. Myrick Freeman III, "Distribution of Environmental Quality," in Allen Kneese and Blair Bower, *Environmental Quality Analysis* (Baltimore: Johns Hopkins University Press, 1972), pp. 269–73.
11. These data may overstate transaction costs for two reasons. First, some research funds may be expended for basic scientific research undertaken solely to increase man's knowledge rather than to assist policy formulation. Second, "other" may include some R&D and demonstration expenditures on abatement technology and should be classified as abatement costs. These data have been adjusted to remove $260 million in this category, but other expenditures may still be included.
12. Based on information contained in Environmental Protection Agency, Office of Air Programs, National Emissions Data System.
13. U.S. Bureau of the Census, *Environmental Quality Control Expenditure and Employment for Selected Large Governmental Units: Fiscal 1970–71,* GSS–No. 63 (Washington, D.C.: U.S. Government Printing Office, 1972).
14. One reason for the relatively small increase in constant dollar expenditures has been the rapid rate of inflation experienced in the cost of constructing sewers and treatment plants. From 1967 to 1972, for instance, the EPA Sewage Treatment Plant Construction Cost Index increased 44 percent, whereas the aggregate GNP price deflator increased only 24 percent. (EPA index computed by Environmental Protection Agency, Office of Water Programs Operations; GNP deflator is given in Council of Economic Advisers, *Economic Report of the President* (Washington, D.C.: U.S. Government Printing Office, 1973), p. 198.
15. Manuel L. Helzner and Rita McBrayer, "Estimating Water Pollution Control Costs for Selected Manufacturing Industries in the United States, 1973 to 1977," prepared by the National Planning Association under contract to the Environmental Protection Agency, 1973.
16. U.S. Bureau of the Census, *Government Finances,* various years. The Census estimates, which include costs incurred by governments only, are higher than the public sector costs reported in Table 4. Two major reasons for this difference are that the Census estimates include such items as street sweeping and other minor sanitation expenses which are not included in the CEQ estimates and that they include municipal payments to private contractors (included in the private sector in Table 4).

17. Leroy Simpson, R. C. Knowles, and J. B. Feir, *Airline Industry Financial Analysis with Respect to Aircraft Noise Retrofit Programs 1972–1978,* prepared by R. Dixon Speas Associates for Department of Transportation, Office of the Assistant Secretary for Systems Development and Technology, Office of Noise Abatement, under contract No. DOT–OS–20088, January 1973.
18. U.S. Atomic Energy Commission, Directorate of Regulatory Standards, "Draft Environmental Statement Concerning Proposed Rule Making Action: *Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion as Low as Practicable for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents,"* January 1973.
19. S. 923 and H.R. 4863, 93d Cong., 1st Sess. (1973).
20. Council on Environmental Quality and Department of the Interior, Bureau of Mines.
21. For a detailed discussion of the more important baselines (stationary source air pollution and municipal and industrial waste water treatment), see Arthur D. Little, Inc., 1972, "Economic Impact Study of the Pollution Abatement Equipment Industry," prepared under contract to the Environmental Protection Agency. A modified version of the ADL methodology has been adopted in Table 6.
22. The analyses of the incidence of pollution abatement costs presented in this chapter are based primarily on information supplied by the Public Interest Economics Center, Inc., working with data and analytical techniques made available by the Brookings Institution.
23. There is disagreement among economists about the real incidence of certain types of taxes. The assumptions used for this analysis are that income taxes are taken from personal income; that general sales taxes are paid by the consumer; that property taxes on land are borne by landowners; that property taxes on improvements are borne by consumers of housing in the case of the residential property tax and by all consumers in the case of commercial and industrial property; and that corporate profits taxes are borne by stockholders.
24. See, for example, *The Economic Impacts of Pollution Control: A Summary of Recent Studies,* prepared for the Council on Environmental Quality, the Department of Commerce, and the Environmental Protection Agency (Washington, D.C.: U.S. Government Printing Office, March 1972).
25. Int. Rev. Code of 1954 § 169.
26. Firms have to choose between either this special accelerated depreciation provision or the investment tax credit in combination with normal accelerated depreciation schedules applicable to all business investment. The tax credit usually provides a significantly larger subsidy than the special pollution equipment depreciation option.
27. Int. Rev. Code of 1954 § 103.
28. John J. Winders, "Tax-Free Anti-Pollution IRBs Head Toward $1 Billion in '73," *The Weekly Bond Buyer* 207:1, March 19, 1973; private communications with the First Boston Corporation, New York, N.Y.
29. Small waste-producing industries, on the other hand, may be subsidizing the general population.
30. Chase Econometric Associates, Inc., October 1972, "The Economic Impact of Pollution Control upon the General Economy: A Continaution of Previous Work" (unpublished report prepared for the Environmental Protection Agency).
31. The computation of the incidence of increased prices assumes that all private costs, excepting those for utilities and automobiles, will be passed through to consumers in proportion to their total consumption (except for housing). This ignores the possibility of differing income-specific price elasticities of demand.

32. This goal is equivalent to that of maximizing net benefits in traditional benefit-cost analysis.
33. Because transaction and avoidance costs were usually relatively small compared to the magnitude of the damage and abatement costs being considered in past policy decisions, these limitations may not have been particularly serious.
34. These estimates agree substantially with subsequent cost analyses.
35. For a discussion of formal mechanisms for making such tradeoffs, see A. Myrick Freeman, III, "Project Design and Evaluation with Multiple Objectives," in U.S. Congress, Joint Economics Committee, *The Analysis and Evaluation of Public Expenditures: The PPB System*, 91/I, 1969.
36. See John V. Krutilla (ed.), *Natural Environments: Studies in Theoretical and Applied Analysis* (Baltimore: John Hopkins Press, 1973).

## CHAPTER 4

# The Law and Land Use Regulation

This country is in the midst of a revolution in the way we regulate the use of our land. It is a peaceful revolution, conducted entirely within the law. It is a quiet revolution, and its supporters include both conservatives and liberals. It is a disorganized revolution, with no central cadre of leaders, but it is a revolution nonetheless.[1]

This court, like other Federal and state courts throughout the country, finds itself caught up in the environmental revolution. Difficult and novel legal and factual questions are posed which require the resolution of conflicting economic, environmental, and human values . . . . Basic value judgments will be made by legislatures and voters which courts can review in most instances not on the basis of the wisdom of these decisions but rather to determine only whether they are permissible within the relevant statutory and constitutional framework.[2]

## New Focus on Land Use—the Quiet Revolution

The capacity of the law to respond to basic changes in society is nowhere more evident than in the field of the environment. Strong new pollution control laws, as well as the concurrent evolution in such legal doctrines as citizen "standing" to sue and the scope of judicial review of agency actions, are good examples.[3]

The quotations that head this chapter point to what might be called a final frontier in this evolution of legal techniques to cope with emerging environmental concerns. The first quotation is from a recent study prepared for the Council that analyzes innovative land use laws and programs in a number of states. As the study shows, expanding state and local efforts to prevent the consequences of unplanned growth, to preserve environmentally sensitive areas, and to prevent land-connected problems of pollution have spawned creative new approaches to controlling the use of land. On the Federal level too—where land use has been called "the most important environmental issue remaining substantially unaddressed as a matter of national policy"[4]—major new proposals for land use regulation are emerging.[5]

These developments are having repercussions in the judicial arena as well as the legislative. One land use issue that is being raised with increasing frequency concerns the possible application of the provision in the fifth amendment to the U.S. Constitution that "private property" shall not "be taken for public use without just compensation."[6] Land use controls inevitably restrict to some extent the way private landowners may use their property. That fact alone, of course, has never meant that such regulations are invalid or that landowners must be compensated for every reduction in the value of their land. A wide variety of zoning and subdivision regulations and other land use restrictions with considerable economic impact have long been accepted as legitimate constraints on private property rights despite the absence of provisions for compensation.[7] At the same time, however, it is generally agreed that if regulation goes too far in restricting private land use opportunities, the regulation will amount to a de facto "taking" of the property, requiring compensation under the Constitution. The question of the ultimate limits on legislative power to restrict the use of property without providing compensation is receiving renewed attention as a result of increased land use initiatives.

Although the "taking" issue arises from the U.S. Constitution, in practical application it is a state and local issue. Land use controls have traditionally been exercised by local governments as subdivisions of the states. Proposals for national land use policy legislation recognize this allocation of authority and seek only to stimulate increased statewide and regional—as opposed to purely local—exercise of such authority, not to involve the Federal Government itself in private land use decisions. Thus, the taking issue discussed in this chapter is not a Federal policy issue. But because it is a significant matter of concern to state and local governments seeking to protect the environment, we are discussing it in our legal chapter, which we use each year to explore major issues of environmental law.

This chapter attempts to place the taking issue in perspective by reviewing the underlying values and historical antecedents of the taking clause and the traditional judicial theories for dealing with the related legal issue. The chapter examines the application of these traditional theories to illustrative environmental controversies and concludes by briefly describing recent judicial developments in dealing with the taking issue.

## Pervasiveness of the Problem

The taking issue is being raised in a variety of contexts across the Nation. In Connecticut, for example, which has shown a special concern for its tidal wetlands and other questions "of the public trust in air, water and other natural resources of the state," [8] new legislation to protect these resources quickly generated litigation with landowners protesting alleged losses in economic values. One large industrial landowner has filed claims for $75 million in compensation because of restrictions on his plans to fill portions of tidal marshes protected under the Connecticut law as vital to the support of various forms of plant and animal life.[9]

Massachusetts has enforced similar wetlands legislation since the early 1960's, requiring developers to secure permits or to conform to strict "protective orders" in order to safeguard the critical ecological balance of such areas.[10] Although crucial portions of the Massachusetts statutes have survived constitutional attack,[11] the taking issue has been a source of protracted litigation in the State since the wetlands legislation was passed. Similar litigation challenging state attempts to protect wetland and estuarine areas have been filed across the width and length of the country from Maine [12] to Florida [13] and from New Hampshire [14] to California.[15]

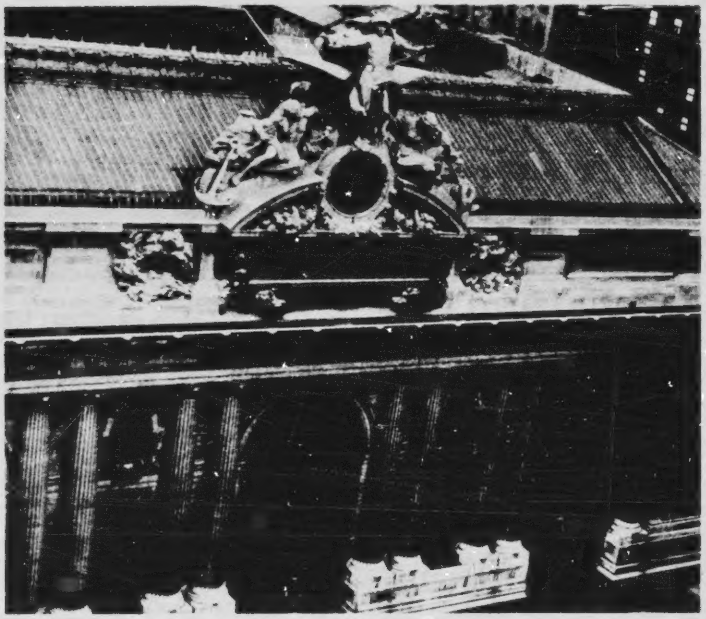
Nor is the issue limited solely to the context of a state's right to protect exhaustible or critical natural resources. The proposed destruction of much of Grand Central Terminal in downtown Manhattan is now the focal point for a legal challenge to New York City's historic preservation laws.[16] After several years of negotiation and debate

The Great Salt Marsh is one area protected by Connecticut's wetlands legislation.

before the city's Landmark and Planning Body, denial of development permission for a 59-story tower on the Grand Central site culminated in the filing of a suit in the fall of 1972.[17]

In yet another context, the tiny New Hampshire Town of Sanbornton moved to avoid environmental and growth problems posed by impending recreational home development. The attempt to regulate such development led to the judicial opinion in the Federal Court of Appeals for the First Circuit from which the second quotation that heads this chapter is taken. The case involved the validity of a 6-acre minimum lot size restriction imposed by Sanbornton which effectively thwarted the plans of a development corporation to construct 500 units of recreational housing and thus led to its claim that property had been "taken."

The town of Ramapo, a short freeway drive from New York City, also found itself the defendant in extensive litigation resulting from a similar attempt to control development pressures—this time in an urban setting. Faced with the need to provide essential urban services as the town was transformed from farmland to suburban home sites, the town government adopted a phased growth program which could result in the denial of some residential building permits for as long as 18 years.[18] Similar attempts to moderate growth pressure



Through New York's Historic Preservation Law, attempts have been made to preserve Grand Central Terminal.

through moratorium proposals are under serious consideration or actual legal challenge in a number of cities in Florida[19] and in other areas of the country particularly sensitive to growth: Boulder, Colo.,[20] the San Fracisco Bay region,[21] and the Lake Tahoe Basin on the Nevada-California line.[22] The developers of Fleur de Lac, a small parcel on the western shore of Lake Tahoe, found their application for a 60-unit condominium blocked because of areawide development controls. The developers filed a suit claiming $4.5 million in damages—the first of over $150 million of filed claims in the area to reach the court.[23] In California, the entire coastal zone has recently come under special State control as a result of voter approval of an initiative measure in November of 1972.[24] In all these areas, public sensitivity to problems of growth seems to go hand in hand with private sensitivity to potential constitutional problems with respect to associated land use regulations.

The frequency with which the taking issue is being raised, however, is not a reliable indicator of the issue's potential as an obstacle to new or existing land use legislation. Experience suggests that many claims for compensation are denied by the courts. Moreover, for every legal challenge raised under the taking clause, there are numerous instances of unchallenged regulation. Thus a more thorough examination of basic taking theory is necessary before one can evaluate the implications of current land use litigation.

### The Basic Values to Be Balanced—Private Property and Public Environmental Concerns

It may be helpful to take note of the basic competing interests that underlie the taking issue. On the one hand, the private property interests protected by the compensation clause occupy a firm place in American constitutional values. Private property is protected not only by the taking clause but, like life and liberty, is also subject to the constitutional injunction against deprivation by the government without "due process of law."

On the other hand, to focus attention on the importance of the concept of private property only sets the starting point for analysis under the taking clause. It has never been the law, of course, that title to land confers the right to use the land however one pleases. The common law of nuisance, for example, has long placed limits on the right to realize economic gain from land in whatever manner an owner desired. In addition, the Constitution has long been held to reserve for the states so-called "police powers" to regulate private activities in order to promote and protect the public health, safety, and welfare. Property rights, in short, do not exist independently of the protections and responsibilities linked with such rights by the law. As those legal protections and responsibilities change to reflect new perceptions of society's well-being, so also does the concept of private property. Thus it is not an exaggeration to state that in determining when a "taking" occurs, a "definition and redefinition of the institution of private property is always at stake." [25] Like the due process clause and other constitutional expressions of broad social policy, the taking clause responds to basic changes in society in a way that reflects new social values.

The relevance of these observations should be obvious. As the Chairman of CEQ recently observed: [26]

> Once, perhaps, it was enough to leave a property owner in virtually full dominion over his land. But that is no longer the case, and more and more people are recognizing that it is essential to extend the public authority over private land if we are to provide some order and preserve some beauty in the very complex urban society of the late twentieth century.

President Nixon, in his message accompanying the Council's First Annual Report, struck a similar theme: [27]

> The uses to which our generation puts the land can either expand or severely limit the choices our children will have. The time has come when we must accept the idea that none of us has a right to abuse the land, and that on the contrary society as a whole has a legitimate interest in proper land use.

The rising number of taking cases will require a reconciliation of traditional notions of private property with the increasing public desire to regulate land use in order to preserve environmental quality. The law seeks to reconcile the inevitable conflicts among basic social values on the basis of reason, common sense, and equity. Even such fundamental constitutional guarantees as freedom of speech are subject to balancing with other constitutionally protected interests and powers and thus are in no sense absolute. Therefore, it seems unlikely that any sort of absolute solution will emerge to reconcile the constitutional taking and police power provisions. The search is for an accommodation that is equitable and fair to private landowners while fully protective of valid public interests, such as the interest in protecting the environment.

## The Traditional Approach to the Problem

### A Brief Historical Perspective

In interpreting basic provisions of the Constitution, one quite commonly looks to the historical antecedents of the clause in question. In the case of the taking clause of the fifth amendment, however, history offers surprisingly little guidance. Indeed, what evidence there is suggests that the concern over government regulation of land, as opposed to outright appropriation of title, is a relatively recent phenomenon dating from around the turn of the century. This at least is the conclusion of a comprehensive study of the taking issue recently prepared for the Council.[28]

According to this study,[29] the idea that Government must compensate owners of private property in certain circumstances originated primarily if not exclusively to deal with the case of actual Government appropriation of the land in question. The study concludes, after an in-depth analysis of over 700 years of legal history—from early English treatises and precedents, through the experience of Colonial America, to the history and immediate aftermath of the Constitutional Convention—that this distinction between actual appropriation on the one hand and "mere" regulation on the other hand was consistently maintained. Disputes were often raised over whether compensation was required even in the case of physical appropriation by a government, and if so, in what manner, but there was never a suggestion that regulation of the uses to which land could be put was in any way related to these disputes.[30] Indeed, toward the end of the 19th century, constitutional treatises were able to restate the law as it applied to the taking issue as follows:[31]

> It is settled doctrine of the States that under general provision common to most of the constitutions, and in the absence of a different statutory role, there must be some actual direct physical interference with the property or some part thereof to constitute the "taking" spoken of in the Constitution. . . . As a consequence of the doctrine, indirect and consequential injuries to property, depreciations in value, and the like, unaccompanied by any direct physical interference, do not constitute a taking.

Other commentators have reached similar conclusions. It has been suggested, for example, that the concept of compensation finds its historical archetype in the case of the wartime seizure by a state of private property urgently needed in order to make room for fortifications or in order to prevent use of the property by the enemy. The purpose of compensation in such cases was primarily to erect a safeguard against arbitrary or tyrannical government conduct[32]—a rationale that presumably has less application in the case of general regulations restricting the use of property in order to protect public health, safety, or welfare.

The history of the incorporation of the taking clause in the Constitution sheds little additional insight into the intended reach of the clause. The Federal "Bill of Rights" was drafted by James Madison after the Constitutional Convention had ended. As presented to the House in a speech during the first session of Congress on June 8, 1789, Madison's proposals included the provision that no person should "be obliged *to relinquish* his property, where it may be necessary for public use, without a just compensation."[33] Here again, the choice of language, equating "taking" with the actual "relinquishing" of property, appears primarily aimed at the case of outright government appropriation of land. The subsequent change in language from Madison's proposal to the present version of the clause is nowhere explained in either the debates or other available records. Indeed, one commentator, considering the lack of attention given the compensation clause, frankly wonders "how it got into our constitution at all." [34]

These historical considerations, of course, are by no means conclusive on the question of the proper reach of the taking clause. The idea that regulation which "goes too far" [35] can amount to a "taking" may be of relatively recent origin, but that fact may itself reflect an historical progression toward the increasing use of regulatory devices with a substantial "consequential" impact on property values. Thus, although regulatory schemes have long existed that impacted to some extent on property values without raising taking issues, there are virtually no court cases before 1890 testing the question of whether such regulation, if it results in particularly severe impact on property values, could amount to a taking. For an answer to this question, one must turn to the judicial opinions of the late 19th and early 20th centuries and to the legal formulae developed by those opinions for resolving the taking issue. This brief historical perspective, however, serves as a valuable reminder that the protection of property rights traditionally has not been thought inconsistent with quite extensive state regulation of the uses to which property can be put.

## The Standard Judicial Approach—No Set Formula

The rising debate over the taking issue does not stem solely from the fact that new land use regulations are being developed on a wide scale. In part the debate also reflects the fact that no ready judicial formula is available for explaining when "regulation"—which only restricts property uses in the exercise of the state's power to protect public health, safety, or welfare—must be equated with an outright "taking" of property for purposes of compensation. Moreover, the judicial theories that have developed for deciding when such regulations require compensation are not always consistently applied.

Among the earliest Supreme Court decisions construing the taking clause is the Court's decision in the latter part of the 19th century in *Mugler v. Kansas.*[36] In that case the Court upheld a Kansas ordinance that forbade the manufacture and sale of intoxicating liquors without compensating the existing brewery owners for the resulting ruin of their business. Nearly 100 years later, in *Goldblatt* v. *Hempstead*,[37] the extent of the Court's progress in developing a consistent taking theory was expressed in the Court's statement that "[t]here is no set formula to determine where regulation ends and taking begins." [38] Like *Mugler, Goldblatt* also upheld the challenged government regulation, which prohibited certain mining practices and required owners to fill mined areas without providing compensation for the resulting economic loss.

On the other hand, the plaintiffs in *Pennsylvania Coal Co.* v. *Mahon*[39]—perhaps the best known Supreme Court taking decision—were more fortunate. In that case, the Court held invalid state legislation forbidding the mining of coal in a manner that would undercut the surface land on which homes, public buildings, and streets had been built. Because the mining companies had previously enjoyed the right to mine in such manner (and homeowners and the public had presumably purchased only surface rights), subsequent legislation, the Court held, could not undo the economic relationship to the disadvantage of one side without providing compensation for the resulting loss.

The absence of a set formula to explain these differences in result does not mean that no attempts at rational distinctions can be made. Indeed, the greater danger is that too many and apparently conflicting formulae will be found to fill the resulting void.

Such, in fact, appears to be the current status of taking theory in the courts. Instead of a single formula, at least four theories for deciding when a taking occurs emerge from the court opinions, with no single theory providing either a consistent or acceptable explanation for the results in all cases. These four theories may be described as the physical invasion theory, the nuisance abatement theory, the balancing theory, and the diminution of value theory.[40]

**The Physical Invasion Theory**—The physical invasion theory corresponds most closely to the paradigm case of government confiscation discussed earlier. Where public agents assume actual legal control over private property, for instance, by compelling transfer of title from the former owner to the government, a classic case of the use of the eminent domain power seems to be presented, requiring compensation. Once one attempts to transform the classic case, however, from a *sufficient* "test for taking" into a *necessary* test, it becomes hard to ignore the fact that actual transfer of title is not always required in order effectively to appropriate all use of a person's property. In an early Supreme Court decision, for example, in *Pumpelly* v. *Green Bay Company*,[41] the Court agreed that a taking had occurred where the complainant's land had been flooded pursuant to state law providing for the construction of dams for the purpose of flood control. "It would be a very curious and unsatisfactory result," explained the Court:[42]

> if . . . it shall be held that if the government refrains from the absolute conversion of real property to the uses of the public it can destroy its value entirely; can inflict irreparable and permanent injury to any extent; can, in effect, subject it to total destruction without making any compensation, because in the narrow sense of the word, it is not taken for public use.

At the very least, it seems, the essence of the classic case must lie, not in the actual transfer of title, but in the physical appropriation or invasion by whatever means, of the right otherwise held by the owner to use and enjoy his property. Once started down this path of reasoning, however, it is not easy to stop. It is not easy, for example, to explain why the appropriation of an owner's right to control the use of his property must be the result of a physical intrusion.

The typical case of government impairment of a property owner's use opportunities, certainly in the modern context, arises from the simple but effective technique of enacting legislation limiting the uses to which such land can be put. Accordingly, three additional judicial theories have emerged for determining whether compensation is required in the case of regulations that fall short of physical invasion or outright confiscation.

**The Nuisance Abatement Theory**—The first theory, which might be called the nuisance abatement theory, is illustrated by the case of *Mugler* v. *Kansas* mentioned above. In explaining why compensation was not required in *Mugler,* in contrast to *Pumpelly,* Justice Harlan observed that in the former case the state was only acting to prohibit a publicly offending use of the property in question: [43]

> The power which the states have of prohibiting such use by individuals of their property . . . cannot be burdened with the condition that the state must compensate such individual owner for pecuniary losses they may sustain, by reason of their not being permitted, by a noxious use of their property, to inflict injury upon the community. The exercise of the police power by the destruction of property which is itself a public nuisance, or the prohibition of its use in a particular way, whereby its value becomes depreciated, is very different from taking property for public use. . . . In the one case a nuisance only is abated; in the other, unoffending property is taken away from an innocent owner.

This theory expresses the idea that where private property is used in a manner that harms the general public, compensation is not required when the public reacts to protect itself from the nuisance-like use.

The nuisance abatement theory has been used by courts to sustain a wide variety of regulations. Particularly where health or safety is involved, regulations requiring individuals to bear the expense of conforming to public standards in the area have been treated almost as if they enjoyed "a special presumption of constitutionality." [44] Cases supporting the uncompensated destruction of diseased trees [45] or animals [46] or upholding food and drug laws, occupational safety standards, fire regulations, and the like without compensating owners for the resulting expense [47] are typical of the theory in operation.

The nuisance theory is, however, subject to criticism to the extent that its application presupposes that the individual subject to the regulation is somehow to blame for the harm caused by its activities and hence is *for that reason* in no position to complain of the economic loss that mandatory abatement entails. The problem with this line of reasoning is illustrated by Justice Sutherland's widely quoted statement that "a nuisance may be merely a right thing in the wrong place." [48]

In many cases, the use that is being made of private property may have been lawful and inoffensive when begun, only to be turned into a "nuisance" because of changed conditions resulting from new growth or new land use patterns in the surrounding area.

A classic illustration is provided by the case of ***Hadacheck*** v. *Sebastian*.[49] That case involved a brick manufacturing operation that was drastically reduced in value as the result of a city ordinance forbidding the use of brick kilns in a residential neighborhood. The Supreme Court sustained the ordinance without requiring compensation even though the nuisance resulting from the smoke and fumes of the operation would not have existed without subsequent residential development significantly postdating the manufacturer's operation. To decide which party in such a case is in the wrong place—the brickmaker or the residential property owners—is to announce a result rather than to explain it. The point is not that cases upholding land use controls on a nuisance theory are wrongly decided. The point is only that one cannot adequately justify such decisions on the grounds that a landowner is necessarily blameworthy for an activity that has come into conflict with the interest of neighboring owners or the public.[50]

**The Balancing Theory**—A third taking theory—and a second formula for determining when regulation requires compensation—employs what may be called a general balancing test. Under this test competing interests, as determined by the facts of a particular case, are weighed against each other. On one side of the balance, presumably, is the extent of the government's intrusion as measured physically or by the loss to the individual; on the other side is the public benefit derived from the government action, including, for example, the alleviation of a nuisance-like activity. A number of courts [51] and commentators [52] have explicitly embraced some such balancing test.

This approach at least has the merit of being able to accommodate almost any example of alleged government taking. But the doctrinal basis for the theory is somewhat questionable. Presumably the theory would make the need for compensation inversely proportional to the degree of public gain: the greater the gain, the less likely that a taking will be found and vice versa. But the public benefit from the action, although it may be relevant in deciding that government action is proper at all, does not seem particularly relevant to whether compensation is required.[53] It is precisely because private property is being taken "for a public purpose" that the fifth amendment requires compensation. Indeed, one might suggest that the more evident the public purpose, the more willing the public ought to be to bear the expense of realizing its interest, rather than shifting the burden entirely to a single individual. Furthermore, the fact that the balancing theory is seldom applied in the converse case—to justify actual physical taking of property where the public gain far outweighs the economic loss to the individual—also casts doubt on the validity of the theory's basic rationale.

**The Diminution of Value Theory**—The most prevalent theory in judicial opinions on the taking issue in the case of land use regulations is what commentators have called the diminution of value theory.[54] This theory seems to center the analysis exclusively on how much economic loss the government action has caused the complaining landowner. The attractiveness of the theory is explained by at least two factors. First, as noted above, discomfort with the logic of the physical invasion theory is most notable when cases otherwise identical in terms of impairment of the owner's use of his property are treated differently solely on the basis of whether a physical invasion occurred. Thus the natural step is to abandon physical invasion as a necessary test for taking and to focus instead solely on what appears as the remaining crucial element: destruction of the economic value of the landowner's property, however it occurs. Second, the Supreme Court decision in *Pennsylvania Coal Co.* v. *Mahon* [55] seems to support the view that a drastic reduction in the economic value of property necessarily triggers the need for compensation. As noted above, the case involved a statute prohibiting the mining of coal in such a way as to cause the subsidence of surface structures. Justice Holmes explained the Court's decision that the coal companies were entitled to compensation for the resulting loss of mining rights as follows: [56]

> One fact for consideration in determining [the limits on the police power] is the extent of the diminution. When it reaches a certain magnitude, in most if not all cases there must be an exercise of eminent domain and compensation to sustain the act. . . .
>
> The general rule, at least, is that while property may be regulated to a certain extent, if regulation goes too far it will be recognized as a taking.

It should be noted that the diminution of value theory, like the balancing theory, seems to serve at best only as a sufficient, not a necessary, test for taking. Thus, actual physical appropriation of land almost always remains a taking even though the intrusion is economically slight.[57] Furthermore, even as a sufficient test for taking, the diminution of value theory is not easily reconciled with the nuisance abatement theory discussed above. Under that theory courts have not hestitated to uphold legislation prohibiting a "noxious" use, even though the result is virtual destruction of economic value. Indeed, Justice Brandeis's dissenting opinion in *Pennsylvania Coal* indicates that resolution of the issue in a particular case will often depend on which theory a court decides should take precedence. By relying, apparently, on the nuisance abatement theory, Justice Brandeis would have sustained the Pennsylvania statute: [58]

> Every restriction upon the use of property, imposed in the exercise of the police power, deprives the owner of some right theretofore enjoyed, and is, in that sense, an abridgement by the state of rights and properties without making compensation. But restriction imposed to protect the public health, safety, or morals from dangers threatened is not a taking. The restriction here in question is merely the prohibition of a noxious use . . . . whenever the use prohibited ceases to be noxious—as it may because of further change in local or social conditions—the restriction will have to be removed, and the owner will again be free to enjoy his property as heretofore.

The diminution of value theory has been criticized both on historical grounds and in terms of its basic rationale.[59] But the most troublesome aspect of the theory is its failure to provide a clear guide to how much economic harm is necessary for the theory to be applicable. Justice Holmes's explanation that a taking occurs when the diminution in value reaches "a certain magnitude" or when regulation goes "too far" leaves unresolved the critical issue of how much is too much. In consequence, a number of subsidiary formulae have been devised by lower courts. Thus, cases fairly consistently agree that a taking does not occur merely because a landowner is not allowed to make the most profitable use of his land [60] or is not allowed to realize speculative investment potential.[61] In other words, a major reduction in speculative value alone does not amount to a taking. At the other end of the scale, regulations depriving property of all potential value or use are often condemned solely on the diminution of value theory.[62] Most cases, however, lie somewhere in between these extremes. The result is that courts typically resort to a formula that awards and denies compensation depending on whether a "reasonable use" of the property remains in the face of the restricting legislation. Furthermore, a reasonable use is often apparently defined to mean some economically profitable use, rather than any possible use.[63]

Aside from the practical problems of deciding whether an owner has been left with a "reasonable" remaining use, the diminution in value theory suffers from certain inherent definitional problems. As Justice Brandeis pointed out, dissenting in *Pennsylvania Coal,* the degree of loss differs depending on whether one simply calculates the value of the coal rendered inaccessible or compares that value with the total value of property that the mining company owns. In the first case, one might conclude that the mining rights have been totally destroyed; in the second case, one might argue that the *relative* economic harm, and hence the owner's ability to bear the loss, is not so significant and requires no compensation. These ambiguities in deciding what the particular "thing" is that has been adversely affected and in deciding what consequent proportion of its value is thus destroyed have led commentators to question the adequacy of the theory.[64]

## The Traditional Approach in the Environmental Context—Illustrative Controversies

As might be expected, the absence of a single theory to determine whether regulation amounts to a taking has led to a certain lack of uniformity among states in resolving the issue in essentially similar fact situations. A survey of judicial solutions to the taking issue in some of the major categories of current land use regulations should provide a basis for anticipating the direction in which these cases appear to be moving.

### Prohibiting Land Fill—the Wetlands Cases

A good example of recent judicial activity in the taking context is provided by the wetlands cases, testing the validity of regulations restricting an owner's right to fill or otherwise develop low-lying marsh or coastal lands. Such restrictions, prompted both by flood control concerns and by a desire to preserve resources critical to the conservation and development of wildlife, often result in depriving the private owner of such land of all potential development value.

Some courts, in such cases, have required compensation solely on the diminution of value theory. The Supreme Court of Maine, for example, in *Maine* v. *Johnson*,[65] held the State Wetlands Act invalid as applied to the particular land at issue on the basis of lower court findings that "appellants' land absent the addition of fill 'has no commercial value whatever.' "[66] Although the *Johnson* opinion also elaborates in some detail on the public interest in preserving the valuable marshland resource, such elaboration appears to be little more than window dressing in light of the court's reliance on a formula that automatically equates the extreme loss of commercial value with a constitutional "taking."[67]

To similar effect is the New Jersey decision in *Morris County Land Improvement Co.* v. *Parsippany-Troy Hills*.[68] That case held invalid a meadow development zone as applied to certain swamplands. Although the zoning legislation in that case allowed a wide variety of explicitly stated uses, the court noted that many of these uses were "public or *quasi* public in nature, rather than of the type available to the ordinary private landowner as a reasonable means of obtaining a return from his property. . . ."[69] In the court's view, "about the only practical use which can be made of property within the zone is a hunting or fishing preserve or a wildlife sanctuary, none of which can be considered productive." The court accordingly concluded that a taking had occurred under a theory requiring compensation where: [70]

> [t]he ordinance so restricts the use that the land cannot practically be utilized for any reasonable purpose or when the only permitted uses are those to which the property is not adapted or which are economically infeasible.

Two recent Connecticut cases follow a similar pattern. In *Dooley* v. *Town Plan and Zoning Comm'n,*[71] legislation placing land in a flood plain zone where no improvements were permitted was held invalid. The case admittedly involved an additional complicating factor: the land at issue had only recently been assessed with an $11,000 special levy for a sewage district, thus adding to the apparent harshness of the subsequent land use restriction. In *Bartlett* v. *Zoning Commission,*[72] however, the court left little doubt that it was followlowing a straightforward diminution of value theory. Tidal wetlands restrictions in that case were held invalid on the basis of a finding that as a result of the restrictions "the plaintiff's use of his property is practically nonexistent." [73]

In contrast to these cases, decisions in Massachusetts and California, apparently employing a more flexible balancing test, have upheld similar wetlands regulations despite their destruction of commercial value. The Massachusetts court, in *Turnpike Realty* v. *Town of Dedham,*[74] explained its decision as follows:

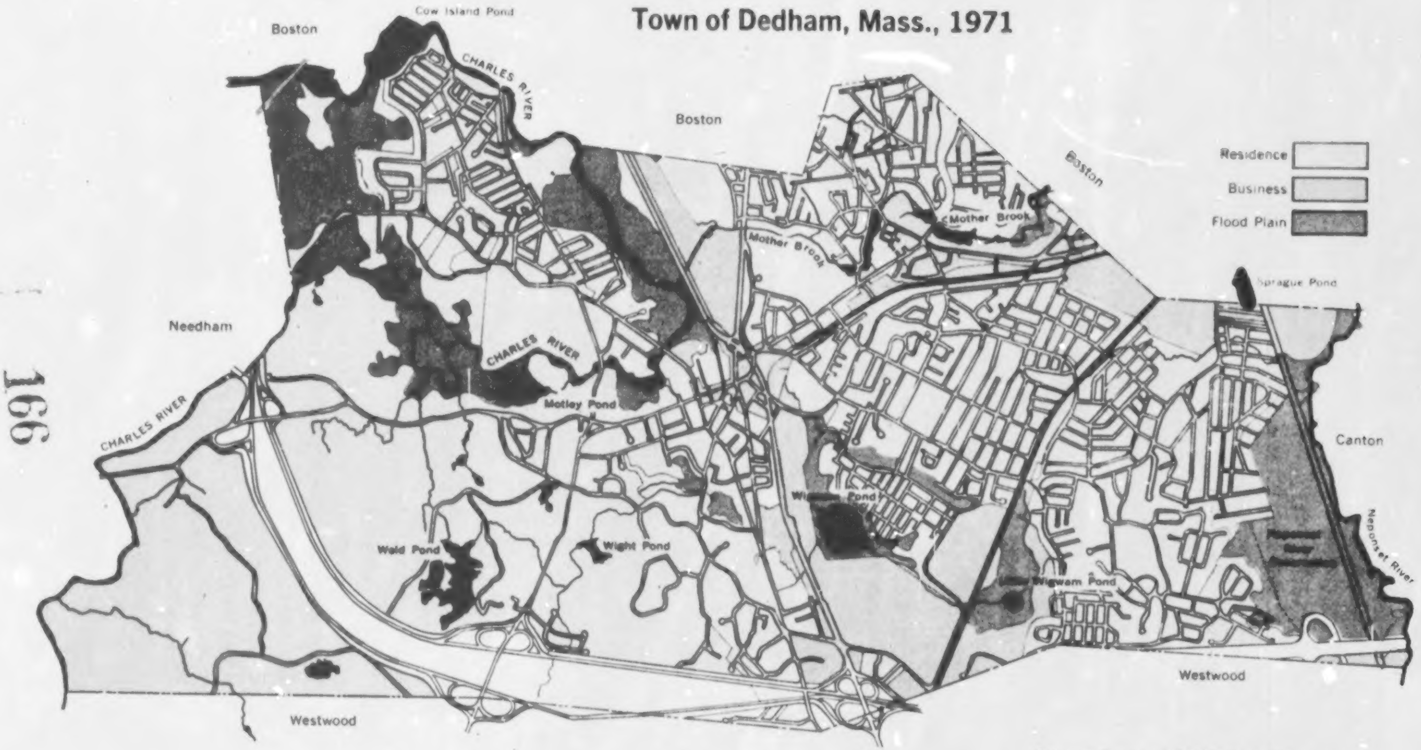
> Although it is clear that the petitioner is substantially restricted in the use of the land, such restrictions must be balanced against the potential harm to the community from overdevelopment of a flood plain area.

In *Candlestick Properties, Inc.* v. *San Francisco Bay,*[75] the California Court of Appeals reached a similar result. It upheld the denial of a permit to fill bay lands, but the rationale for the result was less explicit. Complainant's evidence showed that the land in issue, which was submerged at high tide by the waters of San Francisco Bay, had been acquired in 1964 at a cost of $40,000 specifically "as a place to deposit fill from construction projects." [76] Thus the land had no value "except as a place to deposit fill and as filled land." Without disputing this evidence, the court nevertheless upheld the fill restriction, apparently relying on two considerations. First, the court noted the strong public interest in the restriction: [77]

> The Legislature has determined that the bay is the most valuable single natural resource of the entire region and changes in one part of the bay may also affect all other parts; that the present uncoordinated, haphazard manner in which the bay is being filled threatens the bay itself and is therefore inimical to the welfare of both present and future residents of the bay area; and that a regional approach is necessary to protect the public interest in the bay.

Figure 1

Town of Dedham, Mass., 1971


Boston
Cow Island Pond
CHARLES RIVER
Boston
Boston
Residence
Business
Flood Plain
Mother Brook
Mother Brook
Sprague Pond
Needham
CHARLES RIVER
Motley Pond
CHARLES RIVER
Wigwam Pond
Canton
Neponset River
Weld Pond
Wight Pond
Wigwam Pond
Westwood
Westwood

Source: Town of Dedham, Mass.

Second, the court agreed that "an *undue* restriction" could amount to a taking—citing *Pennsylvania Coal Co.* v. *Mahon*—but concluded that "it cannot be said that refusing to allow appellant to fill its bay amounts to an undue restriction on its use." [78]

It is this latter conclusion that provides the contrast with the Connecticut and New Jersey decisions, noted above, and it is interesting to note the manner in which the California court attempted to distinguish both the decision in *Dooley* and in *Parsippany-Troy Hills*. In *Dooley*, the court explained: [79]

> [T]he restrictions placed upon the use of the plaintiff's land were so extensive that the land could be used for no other purpose than for a flood control district, with the result that the land was depreciated in value by 75%.

In view of the undisputed evidence of the effect of the fill restriction on the value of the plaintiff's land in *Candlestick*, this attempt at distinction seems questionable. More to the point, perhaps, is the court's explanation of how the case differed from *Parsippany-Troy Hills*: [80]

> The purpose of the regulations and restrictions imposed in the instant case is not merely to provide open spaces. Rather, they are designed to preserve the existing character of the bay *while it is determined how the bay should be developed in the future* (emphasis added).

The *Candlestick* opinion thus seems to suggest three possible theories for upholding legislation despite extensive or complete destruction of economic value. The court may be saying: 1) that "reasonable remaining uses" are not to be measured solely in economic terms; 2) that however severe the restriction, it is not "undue" where the public interest is sufficiently great; 3) that a taking does not occur where a mere moratorium is placed on development, pending the completion of a comprehensive plan for rational and controlled future development of the area. In the latter case, of course, resolution of the taking issue may simply have been postponed until the formulation of a more complete conservation and development plan. But under any of these theories, the diminution of value test of *Pennsylvania Coal* appears to have been modified significantly to allow the general interest in preserving existing features of the bay to outweigh the conflicting interest of the private owner in making an economically profitable use of his property.

## Regulating Growth and Development

The control of population growth and density in order to preserve agricultural or rural land or to prevent urban congestion has long been an objective of widespread zoning provisions that prescribe large lot sizes and deep building setbacks. Numerous cases in the urban context hold such restrictions valid, making only brief reference to the potential taking problem.[81] Even where large minimum lot restrictions are involved, the courts have approved such regulations, quite commonly under some form of a balancing theory that measures such things as the drainage, physical, and cultural characteristics of the area against the economic impact of the restriction as well as against minority exclusionary motives that may underlie such zoning techniques in some cases.[82]

In this context, too, the diminution of value theory often seems to deter judicial approval of population density restrictions that prevent substantially all economic use of the property. In a recent New York case, for example, a developer who had purchased 70 acres of land for subdivision into 44 lots challenged a subsequent requirement increasing the minimum lot size. The trial court found that the resultant increase in cost per lot was "significant economic injury" requiring invalidation of the ordinance.[83] It reached this result despite the fact that the area proposed for subdivision was in a part of the town where sewer and water facilities were not planned due to difficulties with the terrain and that the rezoning was initiated as part of a well-coordinated and comprehensive land use scheme for the town. A court of appeals later overturned the trial court decision, finding that the plaintiff's own testimony established that the subdivision was uneconomical under either the old or the new zoning scheme. Thus the impact of the restriction was more relevant "to plaintiff's qualifications as an entrepreneur than to the question of confiscation." [84]

The court did, however, reaffirm the general principle that the landowner would succeed in his challenge if he could show that he was deprived of "any use of the property to which it was reasonably adapted" or if the regulation destroyed "the greater part of the value of the property." [85]

A fairly recent practice in this area of land use regulation is to place a temporary moratorium on growth in order to phase, to time, or otherwise to control residential development. Initial judicial confrontations with this type of regulation often resulted in opinions suggesting that a municipality may not escape the burdens of growth in the guise of regulation to maintain a status quo of artificially low density.[86] Recently, however, courts have increasingly recognized the right of a town to restrict development to some extent in accord with the ability of the municipality to provide essential services. Two cases, one in New York and one in New Hampshire, are particularly illustrative. The New York case, mentioned earlier in this chapter, involved the attempt of the town of Ramapo to phase development in accordance with the community capital budget plan. The plan was fairly simple. Points were assigned according to the proximity of the proposed residential unit to certain required services, such as sewers, fire protection, schools, and the like. Fifteen points were required before a developer could build more than one residential unit on a preexisting zoned lot. The effect of the plan was to keep some land from residential development for as long as 18 years. Faced with the developer's challenge to the plan, the New York Court of Appeals explored the growth pressures and planning work that had led to Ramapo's attempt to eliminate premature subdivisions and unchecked suburban sprawl. The court found that the restrictions were "substantial in nature and duration." However, it rejected the taking challenge, relying in part upon the fact that the restrictions were only "of a certain duration and founded upon estimate determined by fact."[87] The court stressed the community's need to adjust existing physical and financial resources to the demand for essential services and facilities which a growing population requires.

Of equal interest is the decision of the U.S. Court of Appeals for the First Circuit in *Steel Hill Development* v. *Sanbornton*.[88] As mentioned previously, the issue in the case involved the validity of a 6-acre minimum lot requirement enacted by the small New Hampshire Town of Sanbornton in order to preserve the rural nature of the Town and to avoid environmental and growth problems threatened by proposed recreational home development. In upholding the lot size restriction, the court recognized the legitimacy of the general purpose of the legislation and acknowledged the distinction between the problems of controlling suburban as opposed to rural expansion:[89]

> We recognize, as within the general welfare, concerns relating to the construction and integration of hundreds of new homes which would have an irreversible effect on the area's ecological balance, destroy scenic values, decrease open space, significantly change the rural character of this small town, pose substantial financial burdens on the town for police, fire, sewer, and road service, and open the way for the tides of weekend "visitors" who would own second homes. . . .

The court admitted that it was "disturbed" by the lack of evidence that the Town had carefully related this general environmental concern to the specific 6-acre limitation. But it nevertheless upheld the limitation:[90]

> [A]t this time of uncertainty as to the right balance between ecological and population pressures, we cannot help but feel that the town's ordinance, which severely restricts development, may properly stand for the present as a legitimate stop-gap measure.
>
> In effect, the town has bought time for its citizens not unlike the action taken in referendum by the City of Boulder, Colorado to restrict growth on an emergency basis until an adequate study can be made of future needs. . . .

The court's opinion in this case was admittedly aimed primarily at resolving the issue of whether the Town's ordinance was a legitimate exercise of government power at all, rather than the question of whether compensation was required. The latter issue was dealt with summarily under traditional theories by noting that the value of the landowner's property had not been so substantially impaired as to amount to a taking. Both cases, however, reveal an increasingly receptive judicial attitude toward the needs of government in dealing with the problems attendant on unplanned growth.

## Preserving the Quality of the Human Environment

**Open Space Preservation**—In addition to land use regulations designed to preserve critical natural resources or to prevent the adverse effects of unplanned growth or unregulated polluting activities, regulations have also been enacted to preserve or enhance aesthetic, cultural, or recreational benefits for the general public. A common example is the open space or green space requirements imposed on developers as a condition to the subdividing of the land. Such provisions in effect require developers to dedicate a portion of their subdivision to public uses—for example, by setting aside a specified acreage for use as parks or recreational areas. Because such requirements in most cases will not act to deprive the developer of all potential profit, cases upholding such provisions can easily be reconciled with traditional taking theories. In addition, courts often rely on the rationale that because by his subdivision the developer himself has created the additional need for park or playground area, he can reasonably be expected to bear the expense of accommodating that need.

Illustrative of this approach is the 1970 decision of the Connecticut Supreme Court in *Aunt Hack Ridge Estate, Inc.* v. *Planning Commission of the City of Danbury*.[91] The plaintiff in the case was the subdivider of a 275-acre parcel which he proposed to divide into 11 lots. At issue was the validity of a local ordinance, established pursuant to a State statute, that required the developer to set aside an area for a park or playground. According to the court, the test generally applied to determine the validity of such requirements "is whether the burden cast upon the subdivider is specifically and uniquely attributable to its own activity." Finding this test met in the present case, the court upheld the requirement: [92]

> Engaging in the activity is left to [the developer's] own choice. When it undertakes to subdivide, the population of the area is necessarily increased and a need for open space for its people becomes a public one. . . . [T]he complaint is that the plaintiff should be able to assert an individual interest in filling the entire area with housing as superior to the public interest in maintaining a more healthful open space environment. For the reasons already discussed, the public welfare must be paramount.

A 1961 Illinois decision, however, reached an opposite conclusion under a similar ordinance on the grounds that there had been no proof that "the need for recreational and educational facilities . . . is one that is specifically and uniquely attributable to the addition of the subdivision and which should be cast upon the subdivider as his sole financial burden." [93] The facts of the case indicated that the school facilities near the proposed subdivision were already near capacity. Thus the need for additional facilities could not be attributable to the developer's proposal, and the requirement that he provide such facilities appeared to operate as a requirement that he assume without compensation obligations that are more legitimately those of the community.

**Landmark Preservation**—Historic preservation has also been the objective of numerous local ordinances, state laws, and more recently, the National Historic Preservation Act.[94] In the courts, historic preservation has generally withstood challenges based on the taking clause—a result that once again seems to square with straightforward application of traditional taking theory: because property subject to historic preservation requirements will generally still have some economically reasonable use, the mere fact that a more profitable use might have been made by destroying the historic site or structure does not present a constitutional problem. Typical is the comment of a lower New York court in 1968: [95]

> We deem certain of the basic questions raised to be no longer arguable. In this category is the right, within proper limitations, of the state to place restrictions on the use to be made by an owner of his property for the cultural and aesthetic benefit of the community. . . .

Although some courts have questioned whether aesthetic preservation is to be placed on a par with safety and health as a legitimate objective of the exercise of the police power,[96] others have upheld legislative attempts to prevent activities that deface natural scenery and places of historic interest.[97] The relationship of such ordinances to both cultural and economic factors should suffice to establish them within the reach of the police power, leaving the taking question to depend on whether compliance with provisions which prohibit impairment of style or require remodeling or repairing of existing buildings would in effect render them valueless or substantially useless.

An apparently contrary decision was reached, however, by New York's highest court in the case of a law designed to preserve the old Metropolitan Opera House in New York City.[98] The law, enacted by the State Legislature in 1967, provided that the superintendent of buildings of the City of New York could refuse a demolition permit for a period of 180 days upon the request of the trustees of the Old Metropolitan Opera House, Inc., and the deposit by the latter of $200,000. Shortly after the statute was approved, Keystone Associates, which held demolition rights, initiated court proceedings to compel the issuance of a permit. The court found that the deprivation in value caused by the statute was unreasonable and accordingly held the provision invalid. By the time the decision had been rendered, the 180-day period had expired, and by the terms of the statute the superintendent of buildings was required to issue the demolition permit in any event. The implications of this decision for historic preservation provisions in New York are currently being tested in the context of New York's landmarks law as applied to Grand Central Terminal, one of the great classic railroad stations in the country. Penn Central, which would prefer to use the space for an office building that would bring in greater profits, has challenged the requirement that would preserve this structure in its existing state.[09]

## Recent Judicial Trends—the Response to New Environmental Concerns

### The Traditional Approach Revisited

It would be a mistake to conclude from the foregoing examples that the taking issue is significantly involved in every new piece of land use legislation. Equally misleading would be the implication that traditional judicial theories have no applicability to new environmental concerns. The physical invasion theory, for example, has adjusted to the idea that air, noise, or water pollution can amount to "physical invasions" and can constitute a taking of property just as surely as actual entry on land.[100] Similarly, the nuisance abatement theory has long recognized that legitimate public concern over pollution effects and other aspects of the environment justifies regulating land use practices that cause such effects.[101] In like manner, the balancing theory's concept of the public good encompasses increased concerns over pollution and the protection of natural resources as factors weighing in favor of land use regulations.

The single possible exception is presented by the diminution of value theory. This theory—that extreme reduction in the value of land results in a taking of property—seems at first glance to leave little room for consideration of possible countervailing public concerns.

The constraining influence of the diminution of value theory on legislative attempts to preserve environmental quality by appropriate land use restrictions is particularly evident in wetlands cases. To prohibit fill or development in such areas often prevents almost any commercial use of the land. If full compensation were automatically required, states would have to balance these costs against the need to protect declining wetlands resources.

As described earlier, recent state court opinions indicate that the traditional diminution of value theory is being reexamined. Courts are no longer interpreting the taking clause to mean that the elimination of commercial value by regulation must amount to a constitutional taking in all cases. The following sections describe some of the theories that courts and legal commentators have relied on to reach this result.

## The Declining Importance of Economic Loss as a Test for Taking

**The Undermining of the Diminution of Value Theory**—As expressed in the old *Pennsylvania Coal* case, this theory has been undermined in recent years by the U.S. Supreme Court itself as well as by state supreme courts.

In 1962, some 40 years after *Pennsylvania Coal,* the Supreme Court, in *Goldblatt* v. *Hempstead,*[102] decided another mining case, this time involving the validity of a municipal ordinance that regulated dredging and pit excavation on property within the town limits. The ordinance prohibited excavation below the water table and required an operator to refill any excavation below such level. At the time the ordinance was enacted in 1962, the plantiff, who had been dredging and excavating his property since 1927, had excavated some 25 feet below the water table, leaving a lake of about 20 acres. Suit was filed claiming that the ordinance prevented the owner from continuing his business and therefore took his property without due process of law. The opinion of the Court reemphasized that an otherwise valid exercise of the police power "is not unconstitutional merely because it deprives the owner of its most beneficial use." [103] The Court cited *Pennsylvania Coal* for the proposition that a sufficiently onerous regulation could constitute a taking. But it also noted that the loss in value "is by no means conclusive," citing *Hadacheck* v. *Sebastian, supra,* in which a diminution in value from $800,000 to $60,000 was upheld. Because it was argued in *Goldblatt* that the ordinance wholly destroyed the economic value of the land, the opinion suggests that the Court has retreated from the strict diminution in value theory relied on in *Pennsylvania Coal.*[104]

A California Supreme Court case decided at about the same time as *Goldblatt* reached a similar result. In *Consolidated Rock Products Co.* v. *City of Los Angeles,*[105] the court upheld a ban imposed by the City of Los Angeles on rock and gravel mining operations in agricultural and residential districts. The court distinguished *Pennsylvania Coal* by noting that the Los Angeles mining regulation left the owner with some use of his property.[106] But it also suggested that even if this had not been the case, the regulation would have been upheld as a valid exercise of the police power.[107]

In addition to these inroads on *Pennsylvania Coal,* at least one recent study has gone even further to suggest that regulation, as opposed to outright appropriation of property, should never amount to a taking.[108] Although this study finds historical evidence to support its view, the suggestion that regulation can never amount to a taking probably goes beyond the present state of the law. Courts do not completely agree on what is essential to the concept of property. But the mere fact that one has record title to a particular parcel of land by itself seems one of the least important ingredients. It is the practical effect of such ownership, reflected in one's ability to use and enjoy such land, that gives content to the purely formal fact of ownership. When an owner is deprived of all possibilities for use of his land in order to preserve or create a benefit for the public, it is difficult to hold that different legal consequences should attach solely on the basis of whether the government chooses to act by way of condemnation or by regulation. The rejection of distinctions based on form rather than substance is a basic element of American jurisprudence.

On the other hand, land use regulation that is employed to curtail some affirmative harm to the public rather than to permit a public use does not necessarily lose its character as regulation and become a taking simply because some significant economic potential is thereby circumscribed. This distinction, based on "the relation which the affected property bears to the danger or evil which is to be provided against," [109] seems to underlie many judicial decisions sustaining land use regulations in the environmental area.

**The Nuisance Abatement Theory**—Consistent with the above distinction, a substantial body of judicial precedent supports the proposition that in some cases regulation will not amount to a taking despite a major diminution in value. This precedent is best illustrated by cases following the nuisance abatement theory. A leading example is the case of *Hadacheck* v. *Sebastian,* discussed earlier, in which the Supreme Court upheld an ordinance prohibiting the manufacture of bricks despite evidence that the property owner's land was diminished in value by over 90 percent, from $800,000 to $60,000. Justice Brandeis relied on this case in his dissenting opinion in *Pennsylvania Coal.* Two other cases also cited by Justice Brandeis in that opinion were *Mugler* v. *Kansas* [110] and *Powell* v. *Pennsylvania.*[111] In the first case, as noted earlier, the Supreme Court upheld a prohibition on the manufacture of alcoholic beverages which substantially destroyed the economic value of the property. In the latter case, decided just a few years after *Mugler,* a Pennsylvania ban on the manufacture or sale of oleomargerine was similarly upheld against a claim that it constituted a taking of private property. The State of Pennsylvania argued that the prohibition was necessary to protect the public against widespread fraud, because a substantial number of enterprising merchants had been selling oleomargarine as butter. Relying explicitly on *Mugler,* the Supreme Court concluded that no taking had occurred even though the plaintiffs' business had been substantially impaired. Although both of these cases involved what appear to be business rather than land use regulations, in effect they amount to declarations that the land involved could not be used for specified purposes. In addition, these regulations were upheld despite the severity of their economic impact and without investigating the reasonableness of other possible uses.

These precedents, all of which figure heavily in the dissenting opinion in *Pennsylvania Coal,* were by no means overruled by the majority decision in that case. Six years after *Pennsylvania Coal,* the Supreme Court in *Miller* v. *Schoene* [112] upheld a Virginia statute that required the destruction of privately owned red cedar trees that were infected by cedar rust. The rust infection was not dangerous to the cedar trees but was fatal to the fruit and foliage of nearby apple orchards of other landowners. Relying on *Hadacheck* and without even citing *Pennsylvania Coal,* the Court agreed that the paramount public concern justified the State's decision to protect apple trees despite impairment of the value of the complaining landowner's property. "Where the public interest is involved," the Court noted, "preferment of that interest over the property interest of the individual, *to the extent even of its destruction,* is one of the distinguishing characteristics of every exercise of the police power which affects property." [113]

The preceding cases indicate that there is substantial judicial precedent for upholding state nuisance regulations even where the effect is substantial impairment of economic value. In some of these cases, however, the underlying rationale for the nuisance abatement theory is unclear. As noted earlier, the nuisance abatement theory is sometimes tied to the notion that the landowner is somehow to blame for activities determined to be harmful (even in cases in which the harm results from changes in surrounding land uses after the offending activities were begun). But the designation of fault in cases involving conflicting land uses is not inherent in the nuisance theory. In all of these cases, the same result is reached through a recognition of the paramount public interest in preventing certain kinds of activities that are particularly likely to harm a significant segment of the public or surrounding landowners. By focusing on the relative priorities that society attaches to competing interests, courts avoid arguments about which of two or more landowners is primarily "at fault" for a problem.

Even under this approach, however, there are still conceptual problems in some cases in determining just when the theory is applicable. Every legitimate exercise of the police power implicitly involves an assertion of paramount public interest in prohibiting certain private activities. If the nuisance abatement theory is used to determine when such assertions of public interest do not require compensation, it must be because the theory reflects objective standards of society concerning the rights that one can expect to accompany the ownership of property. In *Hadacheck* v. *Sebastian,* for example, the noise, smoke, and fumes emitted by the brick manufacturing operation were typical types of effects that have traditionally been subject to abatement under the common law of nuisance. Thus the Court's conclusion that the concept of "property" does not embrace the right to carry out such activities did not do violence to legitimate expectations about the rights that accompany property ownership. In contrast, application of the theory in *Mugler v. Kansas* is somewhat more questionable. In that case, to label the brewery business a "nuisance" is little more than to announce a reordering of values that the complaining property owners could scarcely have anticipated when their businesses were established. This defect is avoided if the nuisance abatement theory is confined to cases in which some objective standard limits the scope of property rights in accordance with expectations of society.

The nuisance abatement theory, then, is a means of determining those types of cases in which an owner's expectations concerning the use of his land can be said to be unjustified, requiring him to take the risk that such uses will be subject to restriction. Under this approach, the courts avoid redefining "property" in new directions that could not have been anticipated.

The nuisance abatement theory, thus stated, supports a wide variety of land use regulations based on environmental concerns. For example, restriction of land use practices that cause pollution affecting the general public or adjoining landowners, as in the case of many mining activities, do not require compensation under the nuisance theory. The theory's applicability outside the pollution context is indicated by recent court cases discussed in the following section.

**The Critical Natural Features Theory**—As understanding of the interrelatedness of environmental concerns increases, so also does the identification of what might be called critical natural features of the land, the alteration of which will drastically affect areas of vital public concern. The wetlands cases provide a good example. Population and urban expansion pressures have presented developers with opportunities to realize profits through filling or reclaiming wetlands. But such areas in their undeveloped state serve a number of critical public functions, including flood control and ecological balance. To assume that one has an inherent right to alter wetlands ignores interests of the public that have long existed but that until recently have been taken for granted. Courts are beginning to declare that regulations protecting these wetlands functions do not constitute a taking.

As with the nuisance abatement theory, the critical natural features theory does not depend on a subjective view about what is or is not natural or on elevating the natural features of land to special protective status. The emphasis on the functions that certain critical lands serve in their natural state simply explains why a court's determination that a paramount public interest limits the "right" to alter the land's features does not overturn legitimate prior expectations of property owners. To require an owner to assume the risk of changing notions of property in the case of land that exhibits on its face its publicly critical nature is a significantly lesser imposition than the risk assumed, for example, by the brewery owners in *Mugler* v. *Kansas* concerning possible changing public attitudes toward alcoholic beverages.

The most recent case adopting the critical natural features theory is the wetlands decision of the Wisconsin Supreme Court in *Just* v. *Marinette County*.[114] Faced with a taking challenge to prohibitions on the filling of land similar to the prohibitions that had led to conflicting results in other jurisdictions, the Wisconsin court upheld the prohibition, expressing dissatisfaction with "the basic rationale which permeates the decision that an owner has a right to use his property in any way and for any purpose he sees fit." Especially important to the court were the public interests served by the land in its natural state: [115]

> In the instant case we have a restriction on the use of a citizen's property, not to secure a benefit for the public, but to prevent a harm from the change in the natural character of the citizen's property. . . . What makes this case different from most condemnation or police power zoning cases is the interrelationship of the wetlands, the swamps and the natural environment of shorelands to the purity of the water and to such natural resources as navigation, fishing, and scenic beauty. . . .
>
> . . . An owner of land has no absolute and unlimited right to change the essential natural character of his land so as to use it for a purpose for which it was unsuited in its natural state and which injures the rights of others. The exercise of the police power in zoning must be reasonable and we think it is not an unreasonable exercise of that power to prevent harm to public rights by limiting the use of private property to its natural uses. . . .
>
> . . . The Justs argue their property has been severely depreciated in value. But this depreciation of value is not based on the use of the land in its natural state but on what the land would be worth if it could be filled and used for the location of a dwelling. While loss of value is to be considered in determining whether a restriction is a constructive taking, value based upon changing the character of the land at the expense of harm to public rights is not an essential factor or controlling.

*Just* v. *Marinette County* stands as an explicit judicial recognition that regulations preserving certain publicly critical features of land may be upheld without compensation despite great loss in economic development potential.

**The Moratorium Theory**—One additional theory deserves mention as an exception to the idea that severe diminution of value automatically constitutes a taking. The basis for this theory is the new awareness that natural systems are interrelated in complex ways that often preclude prediction of the full range of consequences likely to follow from changes in any single part of the system. The literature of the past 10 years is replete with examples of adverse effects caused by changes in land use that were recognized only after the fact. Draining of swamps reduced aquatic life. Construction of houses on steep slopes caused landslides. Flood plains were occupied. Examples such as these provide pressure in some cases to impose what might be called a legislative moratorium on alterations in certain critical ecological systems pending a fuller understanding of the potential consequences of such alterations. If such pressure is resisted because of a potential compensation problem, irreparable harm may be done or valuable public benefits may be lost for which society would have been willing to pay if only it had had opportunity to calculate accurately those alterations that could be permitted and those that should be avoided.

In such cases, courts are beginning to conclude that prohibition of private development, even if economic value is thus temporarily impaired, does not sufficiently restrict private expectations about the rights that accompany ownership of land to require compensation. Such a prohibition only requires an owner to give up the right to run the risk that the unforeseen consequences of his activities may turn out to be disastrous. Cases illustrating application of this theory, particularly the recent decision of the U.S. Court of Appeals for the First Circuit in *Steel Hill Development Corp.* v. *Sanbornton,*[116] have been discussed earlier in this chapter. Admittedly the theory may only postpone the question of the need for compensation until an adequate study has been made of the proper balance between ecological and population pressures. But *Sanbornton* and related cases support such "stop-gap" measures pending completion of such a study even though the result is to restrict development temporarily.

## Summary and Conclusions

### The Role of the Legislature

The preceding analysis has focused on judicial responses to the potential tensions between the taking clause and state regulatory authorities. However, the relative paucity of U.S. Supreme Court decisions on the issue [117] is an indication that state and local legislative bodies may have considerable latitude in developing land use control measures provided that the legislatures reach a considered judgment of the public interest and the private equities involved in order to allocate fairly the costs of such measures between the public and the private landowners.

Several opinions already indicate that courts will be slower to invalidate controls on constitutional grounds for failure to provide compensation if the legislation and its history evidence such a considered judgment. Deemphasizing the constitutional issue sets the stage for a variety of possible legislative formulae for providing compensation, many of which have received considerable attention in the literature.[118]

A number of legislative approaches to the problem have been discussed in the study undertaken for the Council on the taking issue.[119] These techniques include: creating a system of compensable regulations under which the government strikes a compromise between full payment and no compensation at all, demonstrating a preexisting government property interest in the land, and avoiding the taking issue altogether by buying some or all of the land on which development is to be severely restricted.[120]

A responsible and careful approach to the problem by the legislature may itself be a critical factor in resolving the constitutional issue. It could be, for example, that the Connecticut decisions in *Dooley* [121] and *Bartlett*,[122] both of which invalidated fill prohibitions, might have been decided differently if the legislation had provided for a procedure through which individual development applications could be evaluated. The use of such a special permit technique favorably influenced the Wisconsin court in ***Just v. Marinette County***.[123] By contrast, much of the concern of the First Circuit in the ***Sanbornton*** decision [124] resulted from the apparent arbitrary selection, without supporting explanation, of the 6-acre limitation.

The lesson of such cases is that the constitutional authorization for land use controls cannot be taken by legislatures as an invitation to ignore the resulting burden on individual landowners. By providing procedures to adjust regulations on a case-by-case basis and by carefully tailoring restrictions to keep them as closely commensurate as possible to the problem that justifies the restriction in the first place, legislators can reduce the burden on property owners and avoid potential constitutional problems.

## Evolving Concepts of Property

This chapter began by noting that judicial interpretations of the taking clause necessarily involved defining and redefining the concept of property. The emerging judicial developments and theories outlined above indicate that this process of redefinition appears to be moving in the direction of recognizing that land is a resource as well as a commodity.[125] Basically, the movement is away from the 19th century idea that land's only function is to permit its owner to make maximum profit. Whereas the traditional answer to the question, "Why regulate land use?" was "to maximize land values," the new answer is becoming "to make the best use of our land resources." And the purposes encompassed by the latter answer are a far cry from the simple value maximization concepts of early real estate interests. Conserving land for agriculture, preserving areas of scenic beauty, protecting the rural environment, and preserving the critical functions of wetlands—all of these indicate the extent to which the goal of long-range enhancement of land values is replacing a system aimed solely at increasing the short-run value and salability of land. The interest of the general public and of future generations is no longer ignored in defining the concept of private property.

It is in the transition period between the traditional and emerging concepts of property that the problem of compensation is particularly acute. This chapter shows that there is no single consistent theory for dealing with this problem in all cases. Indeed, despite the criticisms that have been aimed at various judicial formulations, it may well be that no single formula is either possible or desirable. In the final analysis, all such formulae seem to be attempts to extrapolate from what is at base an ethical judgment about the fairness of alternative means of distributing the costs of protecting certain land-related values that yield positive net benefits to society. In most cases that judgment has traditionally suggested that the proper balance between the interests of private landowners and the public is maintained by requiring compensation when land use regulations do not leave the landowner with any "reasonable" use of his property. Increasingly, as new concepts of property have become more firmly established and recognition of the value of land as a scarce resource has mounted, the definition of reasonable use has changed. Automatic application of the reasonable use formula is being replaced by a more flexible approach. This approach provides equitable treatment for the interests involved—those of individual property owners and of society—based on the legitimate expectations of each. The theories discussed above explain the emerging judicial framework supporting this development and bridging the transition between old and new concepts of the rights that accompany ownership of land.

## Footnotes

1. F. Bosselman and D. Callies, *The Quiet Revolution in Land Use Control* 1 (1971) {hereinafter cited as *The Quiet Revolution*].
2. Steel Hill Development, Inc. v. Town of Sanbornton, 4 ERC 1746, 1747 (1st Cir. 1972).
3. See Council on Environmental Quality, *Environmental Quality—Third Annual Report* 221–59 (1972); Council on Environmental Quality, *Environmental Quality—Second Annual Report* 155–77 (1971).
4. Statement by Russell E. Train, Chairman, Council on Environmental Quality, upon release of the report, *The Quiet Revolution in Land Use Control,* Jan. 11, 1972.
5. See Chapter 5.
6. U.S. Const. amend. V. This provision is also applicable to state governments through the 14th amendment. See C.B. & O. Ry. v. Chicago, 166 U.S. 26 (1896).
7. See, e.g., Village of Euclid v. Ambler Realty Co., 272 U.S. 365 (1926).
8. Environmental Protection Act of 1971, § 3 (1966 P.A. 96).
9. Rykar Industrial Corp. v. Commissioner of Agricultural Resources, Superior Court, Hartford County, Conn. No. 170229 (April 2, 1971); see F. Bosselman, D. Callies, and J. Banta, *The Taking Issue,* at 3 (1973) [hereinafter cited as *The Taking Issue*].

10. See *The Quiet Revolution* at 205–25; *The Taking Issue* at 4.
11. See Turnpike Realty v. Town of Dedham, 4 ERC 1344 (Mass. 1972); *The Taking Issue* at 5.
12. See *The Taking Issue* at 8.
13. See *St. Petersburg Times,* Jan. 30, 1973 at 1–B, col. 3; Feb. 1, 1973 at 1–B, col. 1; *The Taking Issue* at 20–22.
14. See Chouinard v. New Hampshire Water Resources Board, 110 N.H. 8 (1969), now in Rockingham County Superior Court; *The Taking Issue* at 5.
15. See Candlestick Properties v. San Francisco, 2 ERC 1075 (Calif. Ct. App. 1970); *The Taking Issue* at 41.
16. See *The Taking Issue* at 11.
17. See Penn Central Transportation Co. v. City of New York, Supreme Ct. of the State of New York, County of New York, No. 14763169 (1972); *The Taking Issue* at 12.
18. See Golden v. Planning Bd. of Town of Ramapo, 334 N.Y.S. 2d 138, 285 N.E. 2d 291 (1972), *appeal dismissed,* 409 U.S. 1003 (1972).
19. See *The Taking Issue* at 21; *St. Petersburg Times,* Dec. 7, 1972 at 10–B, col. 1.
20. See *The Taking Issue* at 38; 60 *Geo. L.J.* 1363 (1972).
21. See *The Taking Issue* at 41.
22. See *id.* at 40.
23. James J. Viso v. State of Calif., Placer County, Calif., No. 38938, Aug. 31, 1972; *The Taking Issue* at 40.
24. See California Public Resources Code §§ 27000 et seq. (1973 Supp.).
25. C. Haar, *Land Use Planning* 410 (1959).
26. Statement by Russell E. Train, Chairman, Council on Environmental Quality upon release of the report, *The Quiet Revolution in Land Use Control,* Jan. 11, 1972 at 6.
27. The President's Message to Congress accompanying *Environmental Quality—The First Annual Report of the Council on Environmental Quality* at xiii (1970).
28. *The Taking Issue.*
29. *Id.*
30. *Id.* at 106.
31. T. Sedgwick, *A Treatise on the Rules Which Govern the Interpretation and Construction of Statutory and Constitutional Law* 455n (2d ed. 1874).
32. See Sax, "Takings and the Police Power," 74 *Yale L.J.* 36, 56–57 (1964).
33. 1 *Annals of Congress* 451–52; 2 Schwartz 1057; Stoebuch, "A General Theory of Eminent Domain," 47 *Wash L. Rev.* 553, at 595, as noted in *The Taking Issue* at 92 (emphasis added).
34. Stoebuch, *supra* note 33, at 594–95, as noted in *The Taking Issue* at 100.
35. Pennsylvania Coal v. Mahon, 260 U.S. 393, 415 (1922).
36. 123 U.S. 623 (1887).
37. 369 U.S. 590 (1962).
38. *Id.* at 594.
39. 260 U.S. 393 (1922).
40. These four theories are identified and extensively discussed in Sax, *supra* note 32, and Michelman, "Property, Utility and Fairness: Comments on the Ethical Foundations of Just Compensation Law," 80 *Harv. L. Rev.* 1165 (1967).
41. 80 U.S. 166 (1871).
42. *Id.* at 177.
43. 123 U.S. at 668–69.
44. 1 U.S. Water Resources Council, *Regulation of Flood Hazard Areas* 389 (1971).
45. Miller v. Schoene, 276 U.S. 272 (1928).

46. See, e.g., Jones v. State, 240 Ind. 230, 163 N.E. 2d 605 (1960).
47. See generally, 1 U.S. Water Resources Council, *supra* note 44, at 389 and cases cited.
48. Village of Euclid v. Ambler Realty Co., 272 U.S. 365, 388 (1926).
49. 239 U.S. 394 (1915).
50. See Sax, *supra* note 32, at 49–50; Michelman, *supra* note 40, at 1198.
51. See, e.g., Rochester Business Inst., Inc. v. City of Rochester, 267 N.Y.S. 2d 274 (1966); La Salle Nat'l Bank v. Cook County, 208 N.E. 2d 430 (Ill. 1965).
52. See, e.g., Kratovil and Harrison, "Eminent Domain Policy and Concept," 42 *Calif. L. Rev.* 596, 609 (1954).
53. Michelman, *supra* note 40, at 1194.
54. Sax, *supra* note 32, at 50; Michelman, *supra* note 40, at 1190.
55. 260 U.S. 393 (1922).
56. *Id.* at 413, 415.
57. Michelman, *supra* note 40, at 1191.
58. 260 U.S. at 417.
59. See, e.g., Sax, *supra* note 32, at 57.
60. See, e.g., Goldblatt v. Town of Hempstead, 369 U.S. 590, 592 (1962).
61. See 1 Anderson, *The American Law of Zoning* § 2.20 at 85 et seq.
62. See, e.g., Arverne Bay Const. Co. v. Thatcher, 278 N.Y. 222, 15 N.E. 2d 587 (1938); Hempstead v. Lyruse, 222 N.Y.S. 2d 526 (Nassau County Sup. Ct. 1961).
63. See, e.g., Arverne Bay Construction Co. v. Thatcher, 278 N.Y. 222, 15 N.E. 2d 587 (1938).
64. Michelman, *supra* note 40, at 1192.
65. 1 ERC 1353 (Me. 1970).
66. *Id.* at 1356.
67. The continued validity of the decision in Maine v. Johnson may, however, be in doubt in light of a more recent decision of the State's Supreme Court, upholding provisions of Maine's Site Location of Development Law. See In re Spring Valley Development, 5 ERC 1127 (1973).
68. 193 A. 2d 232 (N.J. 1963).
69. *Id.* at 241.
70. *Id.* at 242.
71. 197 A. 2d 770 (Conn. 1964).
72. 2 ERC 1684 (1971).
73. *Id.* at 1687.
74. 4 ERC 1344 (Mass. 1972).
75. 2 ERC 1075 (Calif. Ct. App. 1970).
76. *Id.* at 1076.
77. *Id.* at 1081.
78. *Id.*
79. *Id.*
80. *Id.*
81. See, e.g., Clemons v. Los Angeles, 36 Cal. 2d 95, 222 P. 2d 439 (1950); Garvin v. Baker, 59 So. 2d 360 (Fla. 1952); Dundee Realty Co. v. Omaha, 13 N.W. 2d 634 (Neb. 1944); First National Bank v. Chicago, 185 N.E. 2d 181 (Ill. 1962).
82. See, e.g., Zygruout v. Planning and Zoning Comm., 210 A. 2d 172 (Conn. 1965); Steel Hill Development Corp. v. Sanbornton, 4 ERC 1746 (1st Cir. 1972); County Comm. of Queen Anne's Co. v. Miles, 228 A. 2d 450 (Md. 1967); but see National Land and Investment Co. v. Kohn, 215 A. 2d 597 (Pa. 1965).
83. Salamar Builders Corp. v. Tuttle, 3 ERC 1267, 1268 (N.Y. 1971).
84. *Id.* at 1269.
85. *Id.*
86. See, e.g., In re Kit-Mar, 1 ERC 1152, 1154 (Pa. 1970).

87. Golden v. Planning Board of Town of Ramapo, 334 N.Y.S. 2d 138, 155, 285 N.E. 2d 291, 304 (1972), *appeal dismissed*, 409 U.S. 1003 (1972).
88. 4 ERC 1746 (1st Cir. 1972).
89. *Id.* at 1748.
90. *Id.* at 1749.
91. 2 ERC 1164 (Conn. 1970).
92. *Id.* at 1167.
93. Pioneer Trust and Savings Bank v. Village of Mount Prospect, 176 N.E. 2d 799, 802 (Ill. 1961).
94. 16 U.S.C. §§ 470 et seq. (1970); see generally, J. Morrison, *Historic Preservation Law* (2d ed. 1965) (Supplement 1972).
95. Trustees of Sailors Snug Harbor v. Platt, 288 N.Y.S. 2d 314, 315 (1968).
96. See, e.g., Baltimore v. Mano Swartz, Inc., 4 ERC 2035, 2038 and cases cited (Md. 1973).
97. See, e.g., Naegele Outdoor Adv. Co. v. Village of Minnetonka, 162 N.W. 2d 206, 212 (1968).
98. Keystone Associates v. Moerdler, 278 N.Y.S. 2d 185 (1966).
99. Penn Central Transportation Co., et al. v. City of New York, et al., Supreme Court of the State of N.Y., County of N.Y. No. 14763/69; *The Taking Issue at* 12.
100. See, e.g., United States v. Causby, 328 U.S. 256 (1946).
101. See Hadacheck v. Sebastian, 239 U.S. 394 (1915).
102. 369 U.S. 590 (1962).
103. *Id.* at 592.
104. Sax, *supra* note 32, at 42–43.
105. Consolidated Rock Products Co. v. City of Los Angeles, 20 Cal. Rptr. 638, 370 P. 2d 342 (1962), *appeal dismissed*, 371 U.S. 36 (1962).
106. *Id.* at 647, 370 P. 2d at 350.
107. *Id.*
108. See *The Taking Issue* at 103.
109. E. Freund, *The Police Power, Public Policy and Constitutional Rights* 546–47 (1904).
110. 123 U.S. 623 (1887).
111. 127 U.S. 678 (1887).
112. 276 U.S. 272 (1928).
113. *Id.* at 279, 280 (emphasis added).
114. 4 ERC 1841 (Wis. 1972).
115. *Id.* at 1844, 1846.
116. 4 ERC 1746 (1st Cir. 1972).
117. Dunham, "Griggs v. Allegheny County in Perspective: Thirty Years of Supreme Court Expropriation Law" 1962 *Sup. Ct. Rev.* 63.
118. See, e.g., Sax, *supra* note 32, at 172–86, Krasnowiecki and Strong, "Compensable Regulations for Open Space," 24 *J. of Am. Inst. of Planners* 87 (1963).
119. *The Taking Issue.*
120. *Id.* at 236.
121. 197 A. 2d 770 (Conn. 1964).
122. 2 ERC 1684 (1971).
123. 4 ERC 1841 (Wis. 1972).
124. 4 ERC 1746, at 1749 (1st Cir. 1972).
125. See *The Quiet Revolution* at 4.

CHAPTER 5

# Perspectives on Environmental Quality

This chapter seeks to put into perspective some of the past year's significant environmental actions and program trends—where we stand and where we are going at all levels of government in efforts to protect the environment.

It discusses issues of implementation—strategies, institutions, and important secondary effects of environmental programs. Legislative proposals transmitted to the 93d Congress by the President in his 1973 State of the Union Message on Natural Resources and the Environment are also discussed. Nineteen of these proposals were not acted upon by the 92d Congress.

The chapter contains sections on air pollution, water pollution, hazardous pollutants, noise, solid waste, land use, natural heritage, and NEPA. Coverage is necessarily selective, and neither citation nor failure to cite a particular action or jurisdiction implies a judgment on its merits or significance.

## Air Quality—Emerging Effects of the Clean Air Act

The Clean Air Amendments of 1970[1] set in motion a nationwide, Federal-state program to achieve acceptable air quality. In essence, the Clean Air Act requires achievement of national standards of ambient air quality to protect public health by 1975. These are known as primary standards. EPA may grant administrative extensions of up to 3 years if necessary technology or other alternatives are not available. Any more stringent standards needed to protect aesthetics, property, and vegetation—secondary standards—must be achieved within a "reasonable time," as determined by EPA.[2]

The Act specifies major reductions in new car emissions of hydrocarbons (HC) and carbon monoxide (CO) by 1975 and nitrogen oxides ($NO_x$) by 1976—subject to a 1-year extension by EPA if technology is not available.[3] The reductions in emissions are to the level that the Congress estimated to be necessary to achieve the health-based ambient standards even in the most heavily polluted areas of the Nation.[4]

At the time of the Council's last Annual Report, the groundwork for action under the Act was being laid. EPA had translated the Congressional mandate into precise standards for six major air pollutants. States had submitted for EPA approval their implementation plans for meeting the air quality standards within the statutory deadlines.[5]

During the past year, some of the ramifications of achieving clean air came more sharply into focus as requirements established under the Act—primarily those in state implementation plans—took effect.[6] As the agency ultimately responsible for administering the Act, EPA was forced to make hard decisions and deal with complex issues, sometimes under compulsion of court orders stemming from citizen litigation.

Because there is a long lag time involved in preparing analyses of air quality readings from nationwide monitoring stations, we cannot yet report on progress as a result of the 1970 Amendments. However, nationwide data for 1971 primarily reflecting state and local control efforts predating the (December) 1970 Amendments show a continuation of the progress reported last year. Moreover, 1972 data for several major cities support the logical expectation of still further progress as the effects of the 1970 Amendments begin to be felt. These data are discussed in Chapter 6, Environmental Status and Trends.

Test results recently released by EPA show that the increasingly stringent controls required on new vehicles since 1968 by Federal law have reduced emissions from new cars below the levels produced by uncontrolled, pre-1968 vehicles. However, on well over half the vehicles tested, emissions were higher than expected under the applicable model-year standards. EPA attributes this result to a combination of inadequate quality controls by manufacturers, improper maintenance by owners, and the Federal rules that, prior to 1972, allowed manufacturers to average the results of emission certification tests conducted on prototype vehicles.[7]

In addition to its primary effects on air quality, the Clean Air Act is having a number of important indirect or secondary impacts. They relate to land use and the distribution of growth, our auto-dominated urban transportation system and related life styles, energy supplies and policies, and the single largest industrial segment of our economy—the automobile industry.

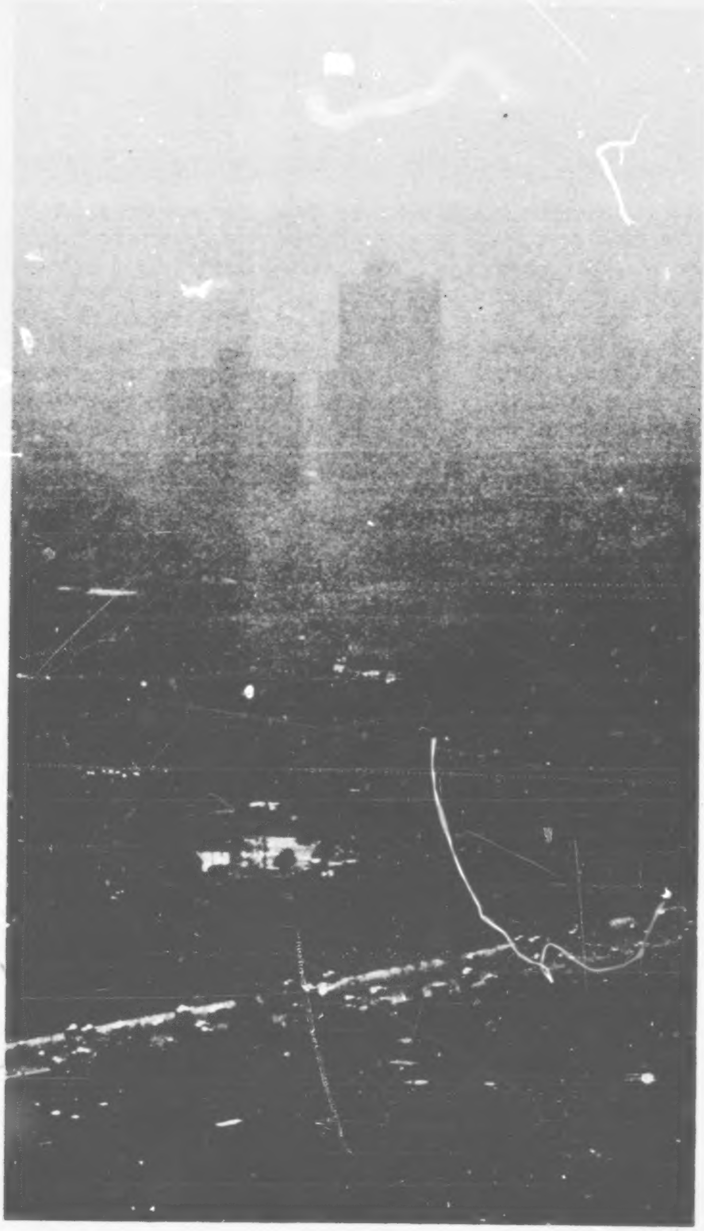
These impacts of the clean air campaign are not surprising. The President, Congressional leaders, and others predicted that achieving clean air would not be a simple process of just reducing emissions, with life going on as usual. Rather, as many have pointed out, protecting the public from health damage and the other costs of dirty air inevitably will cause shifts within the economy toward relatively higher consumption of nonpolluting products and services. It will also alter life styles—particularly those related to intensive urban auto use. Predictably it has taken some examples from real life to call public attention to these secondary consequences, some of which we discuss below.

## Urban Transportation

One of the most dramatic impacts of the Act is on urban transportation, particularly commuter driving habits. For 37 metropolitan areas of the United States that are especially hard hit by automotive pollution, state controls on stationary source emissions and Federal emission limits on new motor vehicles will not by themselves reduce total emissions sufficiently to meet the air quality standards for carbon monoxide, hydrocarbons, and photochemical oxidants—pollutants largely attributable to motor vehicle emissions—by the statutory 1975 deadline. The affected states were therefore required to include transportation controls in their plans for achieving national air quality standards.

On June 15, 1973, pursuant to a Federal court order,[8] EPA announced its approvals and disapprovals of the 43 plans submitted by 23 states for the 37 metropolitan areas.[9] EPA fully approved five plans, for the New York City, Rochester, and Syracuse, N.Y., and Mobile and Birmingham, Ala., areas. Three other plans, for Kansas City (Kansas and Missouri) and Baton Rouge, La., will be approved when the period for public comment on them has expired. Ten other plans, for 7 States and the District of Columbia, were generally approved but had various deficiencies, some only procedural. EPA is working with those jurisdictions (Phoenix-Tucson, Ariz.; Washington, D.C.; Chicago, Ill.; Portland, Oreg.; Philadelphia and Pittsburgh, Pa.; Salt Lake City, Utah; Seattle and Spokane, Wash.; and the Virginia suburbs of Washington, D.C.) to develop fully approvable plans.

To remedy their deficiencies, EPA will promulgate considerable portions of plans for nine regions in the States of Maryland (Baltimore and the suburbs of Washington, D.C.) and Texas (El Paso, Austin-Waco, Corpus Christi, Houston-Galveston, San Antonio, Beaumont, and Dallas-Fort Worth). Plans for 15 regions in 7 States were disapproved because the States did not submit transportation plans (Fairbanks, Alaska; Indianapolis, Ind.; Boston and Springfield, Mass.; Minneapolis-St. Paul, Minn.; New Jersey suburbs of New



Achievement of clean air will require reduced automobile use in 37 urban areas.

York City and Philadelphia; Cincinnati, Dayton, and Toledo, Ohio; and San Francisco, San Diego, Sacramento, Fresno, and El Centro, Calif.). In some of these areas, States are still working to develop and submit plans. The Denver plan was received too late to evaluate before June 15.

As required by the Clean Air Act, EPA proposed full or partial plans for 19 areas, including 5 of the 7 States that failed to submit plans and 7 of the 9 regions where substantial EPA promulgation is expected.

In addition, EPA proposed a revised plan for the sprawling, smog-ridden Los Angeles area in California. Responding to a court order,[10] EPA initially proposed in January 1973 a plan that would have curtailed gasoline sales—and thus automobile use—by up to 82 percent from May to October, when the atmospheric inversions that trap pollutants in the Los Angeles basin are most prevalent.[11] The revised proposal, adopted after extensive public hearings held by EPA, emphasizes alternatives such as mass transit and carpooling.

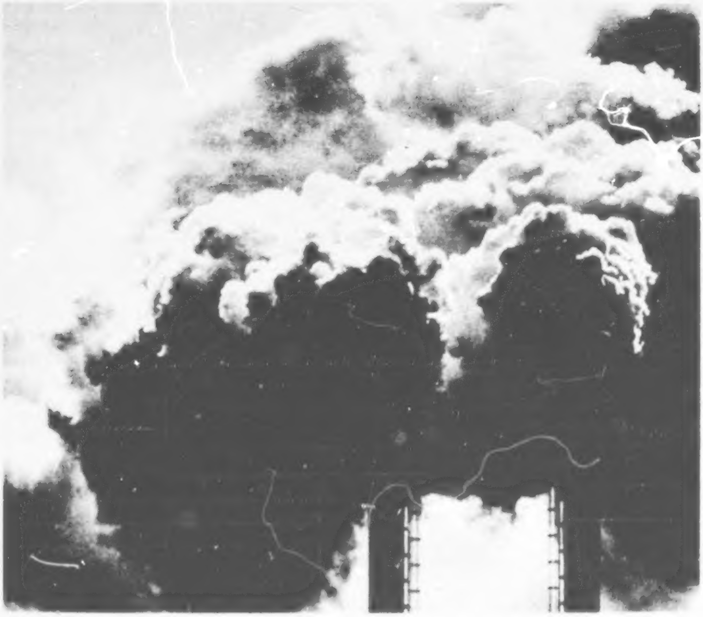
There are two basic types of transportation control strategies—those which reduce miles driven, such as expanded mass transit and carpooling, and those which reduce emissions per mile, such as inspection and maintenance programs, retrofit devices for older vehicles, and changes in traffic patterns. In most cases EPA and the states have required inspection and maintenance. EPA has also emphasized changes in driving habits, particularly expanded use of public transportation. Retrofits have generally been required only as a last resort.

Buses, and particularly rapid rail transit, generate fewer emissions per passenger mile than automobiles.[12] Thus, air quality objectives are a major stimulus for reducing automobile use in favor of mass transit. This shift also reduces urban congestion and conserves energy.

Under the law, EPA must promulgate transportation control plans by Aug. 15, 1973, for areas with unacceptable or inadequate state plans. In order to meet the 1975 statutory deadline for the Los Angeles and northern New Jersey areas, the EPA plans will be forced to require such drastic curtailment of auto use by 1977 as to pose significant potential economic and social disruptions. Therefore, the Acting Administrator of EPA has announced his intention to explore with the Congress the desirability of extending the deadlines for these areas.[13] In general, however, it appears that necessary adjustments can be carried out within the existing law.

## Land Use and Growth

Land use and the distribution of economic growth will be affected by the Clean Air Act's provisions for controlling major new sources of air pollution. EPA is required to establish standards of perform-



States are now required to regulate siting of significant stationary air pollution sources.

ance for new sources based upon the best available demonstrated control technology and processes.[14] EPA has established standards for fossil fuel electric generating plants, cement plants, and sulfuric and nitric acid manufacturing plants and has recently issued proposed standards for seven additional categories of plants.[15] The standards apply even when they are more stringent than the emission limits necessary to meet the air quality standards. One rationale for the performance standards, three of which are being challenged in court by affected industries,[16] is that advanced technology should be employed in major new facilities in order to minimize increases in emissions. Another rationale is that differences in pollution control standards should not be the basis for deciding where to locate new facilities. This would induce regions to compete for new plants by minimizing emission control requirements.

The land use and growth distribution impact of the new source performance standards is neutral—it neither encourages nor discourages siting a plant in any area or type of area. However, the Act requires that states exercise siting controls when necessary.[17] States must be able to preclude the siting of a new facility in a particular area if its presence there, despite best available emission controls, would cause or exacerbate an air quality standard violation.

As a result of a Federal court order in a suit alleging that EPA regulations failed to ensure maintenance of air quality,[18] EPA has issued regulations requiring states to approve in advance the siting and construction of both new polluting facilities and such "complex facilities" as shopping centers, amusement parks, and highways which could cause a violation of air quality standards by attracting concentrations of vehicles.[19] These regulations will provide specific substantive content for the broader land use control programs that states will be encouraged to adopt by the national land use policy legislation now pending in the Congress.

Another legal action, recently concluded by the Supreme Court, involved a significant debate between EPA and some environmental groups on another issue related to growth. The groups argued that one of the Act's stated purposes—"to protect and enhance the quality of the nation's air resources" [20]—requires EPA to disapprove any state implementation plan allowing for significant deterioration in air quality including Federal primary and secondary ambient air quality standards even if such deteriorated air would still not violate those standards. The Federal District Court decided against EPA, and EPA prepared regulations to implement the decision, but the Chief Justice stayed the lower court's order pending the Supreme Court decision.[21] Because the Supreme Court's decision affirming the District Court's order was by a 4 to 4 vote and without opinion, and because the District Court's opinion did not elaborate on its holding, there is very little judicial guidance for EPA in carrying out the nondegradation policy.

The nondeterioration case is significant primarily for its potential impact on the distribution of U.S. economic growth. Unlike the new source performance standards, a nondegradation policy is not neutral between developed and underdeveloped areas. A literal nondegradation policy could severely curtail or even prevent growth in areas with clean air and require instead that growth be accommodated, if at all, in developed areas that may already have severe air quality problems. The extent to which the policy causes such an effect will be determined by EPA's administrative definition of "significant" deterioration.

## Energy

Implementation of the Clean Air Act impinges not only upon land use and urban transportation but on energy supplies as well. The primary impact is that of the sulfur oxides standards on the use of coal, our most abundant and least costly domestic energy resource. The main source of sulfur oxides emissions is the combustion of fossil fuels containing sulfur. Coal tends to produce considerably more $SO_x$ than oil for a comparable output of heat.

In order to comply with state emission limitations designed to meet EPA's national air quality standards, electric utilities, industries, and other users of fossil fuels must cut $SO_x$ emissions in one of several ways. The most common alternative is to use low sulfur fuels—natural gas, low sulfur oil, or low sulfur coal. Another alternative, stack gas cleaning technology, permits the use of higher sulfur fuels, particularly high sulfur coal. Although this technology is being developed rapidly, it will not be available for use in more than a small fraction of U.S. facilities until after 1975.[22]

The problem is that domestic low sulfur fuel supplies are inadequate to meet the demand resulting from the $SO_x$ control approach of many state implementation plans. That approach requires achievement of the more stringent secondary standards at the same time as the primary standards in 1975, even though the Act only requires that the secondary standards be met within a "reasonable time."[23] Many states have established their $SO_x$ emission limits on a statewide basis, meaning that undeveloped areas already meeting both primary and secondary standards are also required to use low sulfur fuels.

As originally submitted to EPA, state plans could thus prevent the use of up to 155 million tons of domestic high sulfur coal per year, requiring instead that up to 584 million barrels of low sulfur oil be imported. This would adversely affect the U.S. balance of payments and domestic coal industry employment.[24]

To ensure that regions needing low sulfur fuel to meet primary standards receive priority and to minimize the adverse economic impacts just mentioned, the Administrator of EPA has formally encouraged the Governors to postpone low sulfur fuel requirements where they are not now needed to meet primary standards.[25] In his April Energy Message, the President specifically endorsed the EPA request. However, under the act, states are authorized to set more stringent clean air requirements than the Act itself requires.[26] Thus the Administrator's request is advisory, not mandatory, and under the Act the states will make the final decision.

Auto emission controls also impact on energy use. Control systems installed on new autos sold in the United States in recent years have contributed to a general decline in fuel economy also caused by automatic transmissions, air conditioning, and heavier vehicles.[27] It has been alleged that some new control systems contemplated for use in meeting the 1975 and 1976 emission standards will produce further fuel penalties. However, the major U.S. auto manufacturer has claimed that this possibility can be eliminated in the catalyst-based systems that his company plans to use to meet the carbon monoxide and hydrocarbon standards.[28] The Acting Administrator of EPA believes that there is a "good chance" that 1975 cars with catalysts will use less gas than 1973 models.[29] Fuel consumption is not necessarily predetermined by use of a particular emission control system.

Moreover, such fuel penalties as may be caused could be offset by such other changes as reducing vehicle weight.

## Autos and the Economy

Earlier discussion touched on the Clean Air Act's potential impact on the distribution of U.S. economic growth, in particular on the siting of stationary facilities. The Act also heavily impacts on the U.S. automobile industry—a large segment of our economy.

The Act's requirements for major emission reductions from new autos in 1975 and 1976 were intended to push the state of control technology as far as possible in order to achieve the primary air quality standards as soon as possible in the most heavily automotive-polluted urban areas.[30] The Act mandates specified emission reductions to be achieved by these dates unless the EPA Administrator allows a 1-year extension. In order to do so, he must determine that the extension is essential to the public interest or to the public health and welfare; that the industry has made all good faith efforts to meet the standards; that the industry has shown that the requisite control technology is not available or has not been available long enough to be put into production; and that other available information, including reports by the National Academy of Sciences, also show that technology is unavailable.[31]

On April 11, 1973, the Administrator granted the extension requested by U.S. automakers for meeting the statutory 1975 standards, imposing somewhat less stringent interim standards instead.[32] This followed by nearly a year his May 12, 1972, decision that, with lead time still available before 1975 production commitments, the manufacturers had not adequately sustained their statutory burden of proving the unavailability of technology. The manufacturers appealed, and a U.S. Court of Appeals ordered the Administrator to reconsider his 1972 decision.[33] The court opinion had a major influence on his 1973 final decision.

The Administrator based his April 11 decision in large measure on a determination that the economic risks of denying the extension outweighed the slight air quality gain. The Court of Appeals had stated that the "public interest" test to be applied by EPA encompasses potential adverse impacts on jobs and the economy in general which could result from a too hasty attempt to introduce a major new technology into complex production lines. The court foresaw problems of quality control and production shutdown.[34]

In summary, the Administrator concluded that the technology available to U.S. manufacturers to meet the 1975 standards—the oxidation catalyst—had not been available long enough to guarantee that possible production difficulties and economic dislocations from its nationwide introduction in 1975 would be less harmful to the public interest than the slight air quality sacrifice caused by a 1-year delay. The Administrator chose the alternative of phasing in the new catalyst technology. He approved special standards for California that will have the effect of requiring the use of catalysts in most 1975 model cars sold in that State. In addition, the national interim standards for 1975 will necessitate the use of catalysts in some models nationwide. This phased approach more nearly approximates the normal industrial approach to introducing new technologies into complex mass-production products.

Although several auto manufacturers have requested a 1-year extension of the statutory 1976 standard for $NO_x$, the debate that once centered on whether the auto emission standards could be met has now shifted largely to the issue of which technology for meeting these standards is most reliable and desirable. (See Figure 1.) U.S. manufacturers are relying almost exclusively on catalyst-based systems to oxidize HC and CO and on a combination of catalysts and exhaust gas recirculation to reduce $NO_x$ emissions. Several foreign manufacturers have been developing alternatives.

Honda and Toyo Kogyo, two Japanese manufacturers, have developed cars that meet the original 1975 standards using less conventional technologies than those being planned by U.S. firms—a carbureted stratified charge engine and a rotary engine with an afterburner. A German manufacturer, Daimler-Benz, has produced diesel-powered Mercedes-Benz autos that also meet the 1975 standards. However, diesel engines have potential odor, particulate, and noise emission problems that may be difficult to control.

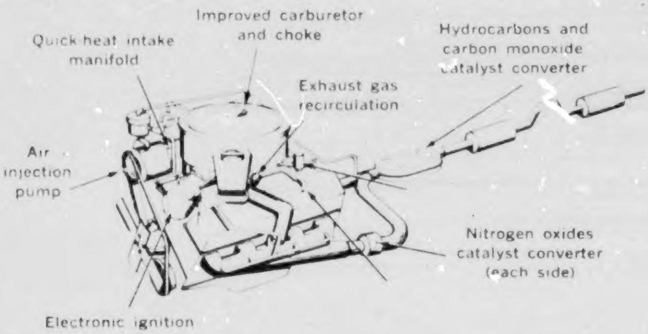
There is considerable scientific opinion that a system like the Honda stratified charge system is more desirable than the catalyst approach because of its reliability and fuel economy. The National Academy of Science's special panel on automotive emissions control technology, for example, shares this opinion.[35] Although further refinements may be achieved, current indications are that catalysts are not durable, requiring replacement at least every 25,000 miles, and that they may impair overall vehicle performance. Alternatives appear not to have such drawbacks, but they have not been fully tested for use in the larger autos made in the United States.

Consistent with the Clean Air Act, EPA has taken the position that performance specifications—not particular technologies—should be mandated for emission control. The Administrator has expressed confidence that the superior technology or technologies will win out in the marketplace on the basis of cost (including fuel economy) and performance.[36]

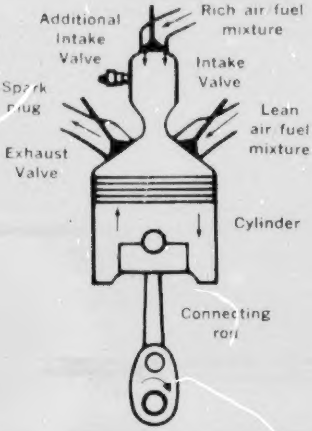
The verdict is not yet in on auto emission control technologies. However, it is clear that the Clean Air Amendments of 1970 have succeeded in stimulating significant technological innovation in Detroit and elsewhere.

Figure 1

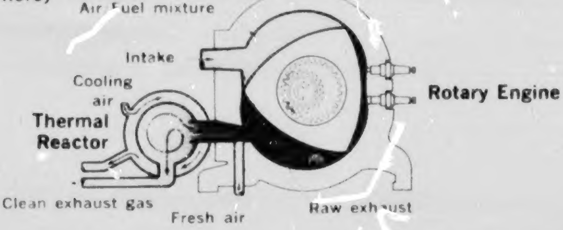
## Three Systems Designed to Meet Stringent Automotive Emission Standards


Improved carburetor and choke
Quick heat intake manifold
Hydrocarbons and carbon monoxide catalyst converter
Exhaust gas recirculation
Air injection pump
Nitrogen oxides catalyst converter (each side)
Electronic ignition

**Conventional internal combustion engine with dual catalysts**


Additional Intake Valve
Rich air fuel mixture
Intake Valve
Spark plug
Lean air fuel mixture
Exhaust Valve
Cylinder
Connecting rod

**Conventional internal combustion engine with stratified charge combustion (single cylinder with the added SC combustion chamber shown here)**


Air Fuel mixture
Intake
Cooling air
Thermal Reactor
Rotary Engine
Clean exhaust gas
Fresh air
Raw exhaust

**Rotary internal combustion engine with thermal reactor**

Source: General Motors Corporation; Honda Motor Company; Mazda Motors of America

## Standards and Monitoring

During the year prior to our last Annual Report, a number of lawsuits were initiated by industries challenging various EPA air pollution standards. These actions are still pending.[37] Such litigation reflects the complex technological and scientific factors involved in establishing standards under the Act. In 1971, Kennecott Copper Company requested judicial review of EPA's ambient sulfur oxides standards. In response, and as part of its continuing review of the criteria for setting such standards, the agency in May 1973 proposed to rescind the annual arithmetic mean portion of its secondary standard for sulfur oxides. This action would leave intact that portion of the standard limiting the permissible level of short-term (3-hour) emissions allowed once each year.[38] Extensive reevaluation of a study of how sulfur oxides affect white pine growth led EPA to conclude that vegetation damage stems from high-level concentrations for short periods rather than from continuous exposure to lower levels.

The proposed revision is likely to have little effect on urban areas, where the rescinded annual ceiling (60 micrograms per cubic meter) is still a useful guideline for ensuring compliance with the 1,300-microgram, 3-hour limit. Isolated rural area sources, such as mine-mouth generating plants, may be forced to achieve stricter controls than previously planned, especially if EPA decides to reduce the short-term limit to 1 hour. However, under certain conditions the new short-term standard will permit such facilities to consider variable or "intermittent" controls in order to minimize costs.

During the past year, EPA faced another issue involving the scientific basis for both standard setting and monitoring. EPA concluded that nitrogen oxides, a combustion product in both mobile and stationary sources, is not the widespread problem that it was thought to be. The methods previously recommended by EPA for measuring ambient levels of $NO_x$ were found to overstate concentrations. EPA now believes that only 2 air quality regions—Chicago and Los Angeles—rather than the 47 originally identified, definitely exceed the national ambient air quality standard for $NO_x$. EPA estimates that only Baltimore, Chicago, and Los Angeles will require reductions in $NO_x$ emissions beyond those required by the current (1973) auto emission standard, 3.1 grams per mile, in order to meet the ambient $NO_x$ standard by 1977. Only Los Angeles would fail to meet the ambient $NO_x$ standard with retention of an extremely stringent auto emission standard for $NO_x$, such as the 0.4 grams per mile now required nationwide for 1976. These EPA estimates do not fully take into account possible $NO_x$ emission reductions from transportation controls and improved stationary source controls. Thus the estimates represent the maximum number of areas that could fail to meet the ambient standard. Uncertainty about the method of monitoring $NO_x$ led EPA also to reexamine the validity of the primary ambient $NO_x$ standard, but the agency concluded that the standard as presently formulated protects public health, as required.[39]

The practical result of EPA's new information is twofold. First, EPA will exempt most of the 47 regions originally identified as having serious $NO_x$ problems from the requirement of adopting stationary source controls for $NO_x$. Second, EPA has concluded that the current statutory requirement for a 90 percent reduction from 1970 levels of $NO_x$ auto emissions by 1976 (i.e., 0.4 grams per mile) may be unnecessary. EPA will make recommendations to the Congress next fall on possible changes in the law's 1976 $NO_x$ requirement. The recommendations will be based in part on the results of June 1973 hearings on the request by auto manufacturers to extend the 1976 standard for 1 year.[40]

The significance of EPA's new information on $NO_x$ is heightened by the fact that $NO_x$ is one of the most difficult pollutants to control for both mobile and stationary sources. Relaxing the automotive emission standard for $NO_x$ could have a positive effect on the ability to control other automotive pollutants. Existing controls for HC and CO raise gasoline combustion temperatures. At higher combustion temperatures, more $NO_x$ is generated. Each tightening of HC and CO controls, therefore, makes it harder to control $NO_x$ emissions. Further, the system contemplated by U.S. auto manufacturers for meeting the statutory 1976 $NO_x$ standard would involve a second catalyst which, together with additional engine modifications, could decrease fuel economy an additional 7 to 12 percent, at least temporarily.[41]

Through its broad effort to refine and expand scientific data on the levels, interactions, and health effects of air pollutants, EPA is building the base for more effective regulation. For example, studies completed this past year have identified sulfates—a common by-product of sulfur oxides emissions—as a potential culprit in the damage caused by sulfur oxides. Extensive community epidemiology studies are helping EPA to refine its knowledge of the health effects of various pollutants.

## Summary

The Clean Air Amendments of 1970—the pioneer in a new era of Federal environmental legislation characterized by stringent standards and deadlines and broad Federal enforcement powers—are now weaving their requirements and constraints through the fabric of the Nation. The process is being hastened by a combination of administrative actions dictated by statutory deadlines and frequent elaboration of the statutory directives by Federal courts. Achievement of clean air is clearly not a simple matter of putting sophisticated corks in smokestacks and tailpipes. The great diversity of air pollution sources and their interrelationships with many facets of our lives have made the quest for clean air a major challenge. The Clean Air Act provides a vigorous mechanism for meeting that challenge. With the limited amendments that appear to be needed to take account of new information and to alleviate problems in areas such as Los Angeles, it should significantly enhance the progress toward clean air that we have already made.

## Water Quality—Extensive New Authorities

Enactment last October of the comprehensive Federal Water Pollution Control Act (FWPCA) Amendments of 1972[42] culminated nearly 3 years of Executive and Congressional deliberations aimed at strengthening our clean water program. There were numerous differences among the Administration, state officials, and Congressional leaders over various aspects of the legislation, but there is strong consensus on many basic features of the new law. Consistent with the President's proposed legislation, it extends Federal-state regulation to all navigable waters, requires specific effluent standards for individual facilities to be implemented through permits, makes mandatory the use of the best available demonstrated technology in new facilities, authorizes stringent Federal standards or prohibitions for toxic discharges, strengthens and streamlines Federal enforcement procedures, authorizes large fines, permits citizens to bring legal actions to enforce its requirements, and strengthens the Federal grant program for municipal treatment plants while working toward self-sufficient financing of treatment plants once the current backlog of needs has been met.

As early as 1970, there was widespread agreement that the Federal-state program established under the 1965 Water Quality Act and earlier laws was substantially inadequate. Notwithstanding cleanup efforts in some states and success stories like the Willamette River, which is discussed in Chapter 2, the overall national picture was bleak. Scant data available indicated that at best the Nation had only "held the line" on common organic pollution in recent decades. The effects of increased treatment had been virtually cancelled by larger wasteloads.[43] Other forms of water pollution, such as phosphate and nitrate nutrients, were on the rise. Fish kills, beach closings, algal growths, oily scums, and odors were still prevalent.[44] Sporadic upgradings of municipal treatment plants were often more than offset by nearby industrial effluents. In other cases, cleanups of industry were offset by increasing municipal discharges. There was no real national strategy.

This section summarizes the principal features of the 1972 law that was designed to correct past failures and set the course for a

Victims of a massive fish kill caused by polluted waters cover a river bank.

sustained water quality improvement program. It also identifies basic public policy themes underlying the new law and their implications for both citizens and government.

## Summary of P.L. 92–500

The law's basic regulatory requirement is that "point source" discharges—industries, municipal treatment plants, feedlots, and other discrete sources—must obtain a permit specifying allowable amounts and constituents of effluent and a schedule for achieving compliance.[45] States meeting requirements specified by the Administrator of EPA are to administer the national permit program, with individual permits subject to EPA review. EPA will issue the permits in states that fail to submit or carry out an approved permit program and for Federal facilities.[46]

Permits must be consistent with applicable effluent guidelines to be issued by EPA for major classes and categories of industrial facilities or with EPA requirements for publicly owned waste treatment works.[47] The technology-based effluent limitations and the water quality standards that may dictate more stringent effluent limitations are to be applied in two phases. By 1977, municipal plants must provide "secondary treatment" [48]—a common level of treatment for organic wastes, usually based on bacterial decomposition and stabilization. Also by 1977, industrial facilities must comply with EPA's effluent guidelines prescribing "best practicable control technology currently available." [49] Stricter effluent limitations for both industry and municipalities will be required in individual cases if best practicable technology or secondary treatment is inadequate to meet ambient water quality standards which are set on the basis of water uses, such as propagation of fish and wildlife and recreation.[50]

By 1983, municipalities must provide "best practicable waste treatment technology," [51] and industries must comply with effluent guidelines prescribing best "available technology economically achievable" which will result in "reasonable further progress" toward the goal of eliminating the discharge of pollutants.[52] More stringent effluent limitations may be imposed for individual industries or municipalities when necessary to "contribute" to water quality needed to "assure protection of public water supplies, agricultural and industrial uses, and the protection and propagation of a balanced population of shellfish, fish and wildlife, and allow recreational activities in and on the water." The more stringent limitation will not apply, however, if the discharger demonstrates that there is "no reasonable relationship" between the economic and social costs and benefits to be obtained.[53]

In addition to issuing effluent guidelines for existing point sources, EPA must set special effluent standards for new industrial point sources, based on best available demonstrated control technology. These will apply to at least 27 categories of sources listed in the Act.[54]

The Administrator must also publish a list of toxic pollutants and effluent limitations or prohibitions for them. Toxic pollutants are defined as those which, when assimilated either directly from the environment or indirectly by ingestion through food chains, will cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions, or physical deformities in any organism or its offspring.[55] Spills of toxic or other hazardous materials are now subject to the same regulatory framework—for prevention and Federal cleanup costs—that previously existed only for oil spills.[56]

The Administrator must also issue pretreatment standards requiring an industrial facility discharging into a municipal sewage treatment plant to pretreat its effluent so that it does not interfere with the operation of or pass through the plant without adequate treatment.[57] Because roughly one-half of all industrial facilities discharge their wastes into municipal systems, pretreatment standards are essential to achieving control over industrial effluents.

The Act requires states to develop a comprehensive and continuing planning process for water quality management.[58] Plans must include not only the point source controls described above but also controls for diffuse land runoff and other nonpoint sources. Beginning in 1975, the states must submit annual reports to EPA that inventory all point sources of pollution, assess existing and anticipated water quality, and propose programs for nonpoint source control.[59]

EPA has authority to enforce the law through both administrative and judicial channels. When the Administrator discovers a violation of a permit condition or other provision of the law, he must notify the polluter and then either issue an administrative order prohibiting further violation or request the Attorney General to seek appropriate relief in Federal court.[60] The discharge of pollutants from point sources except in compliance with a permit is unlawful.[61] However, recognizing the task of processing permit applications and the need to give applicants a fair opportunity to determine what is expected of them, the law includes an exemption from prosecution until December 1974 for facilities for which a satisfactory permit application has been filed but not finally acted upon.[62]

Private citizens may seek judicial relief against any polluter for violating an effluent limitation or an administrative order. Citizens may also institute proceedings against the Administrator if he fails to perform a nondiscretionary act required by the law.[63]

An expanded Federal grant program will help municipalities construct sewage treatment plants. More than 1,300 communities have sewer systems that discharge untreated wastes, and a comparable number provide only primary treatment.[64] The Administrator is authorized to make available to the states up to $18 billion for fiscal years 1973 to 1975 for municipal waste treatment project grants. The Federal share of these projects is 75 percent, compared to the prior maximum of 55 percent. The remainder is borne by the municipalities, which sometimes also receive state aid. Industrial users must reimburse the Federal and local governments for the share of project costs attributable to them.

## Factors That Shaped the Law

Forging the new national program for water quality was not simple or easy. It was under development for nearly 3 years. A diversity of opinions on goals and the complexity of achieving water quality precluded a full consensus. Myriad factors and views helped to shape the legislation. This section seeks to highlight some of the principal ones in order to give some perspective on the law's origins.

Perhaps the predominant influence on the law was the universal recognition that basing compliance and enforcement efforts on a case-by-case judgment of a particular facility's impacts on ambient water quality is both scientifically and administratively difficult. To minimize the difficulties in relating discharges to ambient water quality, the law requires minimum effluent limitations for each category of discharger, based on technological and economic feasibility, regardless of receiving water requirements. When water quality standards cannot be achieved by imposition of these controls alone, receiving water conditions will be used to dictate to individual dischargers more stringent limitations. The complexities of relating effluent amounts to ambient quality also led the Congress, as in the

Clean Air Act, to provide that the effluent limit, not ambient quality, is the basis for enforcement actions.[65]

Another major influence on the new law was the Congressional sentiment that the Nation as a whole ought to establish and work toward an ultimate clean water goal.[66] Prior law rested on a de facto goal of making individual waters clean enough to support one or more beneficial uses—such as fishing, swimming, boating, and water supply for homes, farms, and industries—in each case determined by the states to be desirable and feasible.[67] This approach recognized that different waters would, as a practical matter, support different combinations of uses which in turn would require different ambient water quality conditions.

By contrast, the new law rejects for the purpose of policy objectives both distinctions among water bodies in terms of use and the concept that contaminants can be rendered harmless and thus tolerated below certain concentrations. The law aims "to restore and maintain the chemical, physical, and biological integrity of the Nation's water." As national goals to achieve this objective, it calls for eliminating pollutant discharges altogether by 1985 and, whenever attainable in the interim, achieving water quality providing for protection and propagation of fish, shellfish, and wildlife and for recreation in and on the water by 1983.[68] The law does not, however, actually mandate attainment of these objectives and goals. The no-discharge goal is mandated by 1983 only for categories and classes of nonmunicipal dischargers for which it is "technologically and economically achievable." [69] During this same period, effluent standards must be established for all dischargers "which can reasonably be expected to contribute to the attainment or maintenance" of the water quality needed to achieve the 1983 interim goal.[70]

Public waste treatment facilities are critical to achieving clean water. This fact, and the need for substantial Federal aid to communities in providing the facilities, had a major influence on the new legislation. Construction of treatment facilities is now one of the largest Federal public works programs.

Under prior law, substantial Federal funding to help finance a large backlog of construction needs became available only in the past several years. In order to ensure adequate continued funding, the Congress in the new law authorized future spending by EPA on a "contract authority" basis, thus bypassing the usual annual Congressional appropriations process. Now EPA can obligate funds within authorized limits prior to appropriations.[71] The Congress also increased the Federal share for treatment plant construction from a 30 percent minimum-55 percent maximum to a uniform 75 percent.

The construction grant authorizations in the new law—a total of up to $18 billion over fiscal years 1973 to 1975 [72]—prompted a Presidential veto, which was overridden. In his veto message, the President stated that this amount is excessive in relation to needs and is far out of line with regard to his total Federal budget aimed at

The Des Moines sewage treatment plant discharges effluent into the Des Moines River, part of which is covered by ice.

controlling inflation and taxes.[73] The President also stated that intense pressures for spending the full $18 billion might well negate the effect of provisions in the law giving him "technical" flexibility and discretion in the allotment of those funds.

Following the Congressional override of his veto, the President directed EPA to make available ("allot") to the states for fiscal years 1973 and 1974 "sums not to exceed $2 billion and $3 billion respectively."[74] The law authorizes Congressional appropriation of "sums not to exceed" $5 billion and $6 billion respectively and directs that "sums authorized to be appropriated" be allotted.[75]

Claiming that the EPA action exceeded the discretion that the Congress gave to the Administration, several cities filed lawsuits to force allotment of the full $11 billion authorized for 1973 and 1974. In one such action brought by New York and Detroit, a Federal District Court ordered EPA to make the full allotment. The court recognized, however, that the law confers flexibility in actually spending the funds.[76]

The essence of the legal debate is whether language changes made in the law during the House-Senate conference enable EPA to make available to the states for a particular fiscal year less money than the maximum amount authorized or whether, as the court held, they only allow EPA to obligate during the fiscal year less than the maximum amount authorized (and made available) for the year.

Another major concern was industrial use of municipal facilities receiving Federal construction grants. Under prior law, industries using municipal plants received a Federal subsidy for their waste treatment costs. Because industrial use of municipal plants is sometimes more cost effective and environmentally desirable than separate treatment, the new law did not foreclose this alternative. Instead, it insists that industries must pay their way. Industries using municipal plants are now required to pay their share of construction costs and also user charges.[77] It is too early to know to what degree industry will continue to utilize municipal plants.

Finally, the law's user charge and industrial payback provisions reflect Congressional and Executive concern that Federal funding for treatment plants not become a bottomless pit and that municipalities move toward self-suffiicency in maintaining and replacing facilities in existence or under construction.[78] The underlying economic principle is that those whose activities necessitate waste treatment—rather than the Nation's taxpayers—should pay for it.

## A Stronger Federal Role

P.L. 92–500 is long (89 pages) and exhaustively detailed. It places many explicit and difficult demands on all levels of government, on industries, and on others in the private sector. A major theme permeating the legislation is a strong role for the Federal Government. Implementation is to be carried out largely by the states, but most of their actions are subject to extensive Federal guidelines and backup enforcement authority.

**Permits**—The heart of the water quality program—the permit system—is a prime example of the new pattern of Federal-state relations in water quality management. It sprang from the permit program established by the President in 1970 under the Refuse Act of 1899.[79] Frustration with the Federal-state water quality program stimulated the "discovery" of this 1899 law, administered by the Army Corps of Engineers primarily to protect navigation. It had been interpreted by the Supreme Court in the mid-1960's to proscribe pollution of navigable waters in the absence of a permit, whether navigation was affected or not.[80] But it was not until 1970 that its potential as an administrative tool was recognized.

The Refuse Act permit program[81] was initiated as a means to accelerate and strengthen cleanup efforts pending new legislation. The permit mechanism had the virtue of establishing for the first time a comprehensive information-gathering system for industrial effluents. It provided for each discharging facility a specific treatment and timetable to eliminate haggling and uncertainties between Government and industries. Numerous legal actions were brought in 1971 and 1972 against firms discharging without permits and in violation of standards.[82] Unfortunately, the permit program was aborted and the enforcement program halted by two Federal court decisions, one recently overturned by the Supreme Court.[83] Before Government appeals were completed, the new law was enacted, establishing a new permit program that makes virtually all of the debates involved in the two cases moot.

The new law encourages states to assume administration of the new permit program, called the National Pollutant Discharge Elimination System (NPDES). But they can do so only by adopting a variety of enforcement, public notice, and other authorities and procedures specified by EPA. After a state program is approved by EPA, each permit (except in categories that may be waived by EPA) is subject to EPA review and veto to ensure its consistency with requirements of the law, including deadlines, and with EPA's effluent guidelines.[84] It may be some time before many states have all the authorities needed to secure EPA approval for their permit programs. Eighteen states and territories were given interim EPA authorization for their permit programs which expired on March 19, 1973.

In April, California became the first state to receive a permanent NPDES approval for its permit program. Another six states are close to receiving approval. Meanwhile, EPA itself is processing permit applications. As of May, nearly 33,000 permit applications were pending, many of which were originally filed under the old Refuse Act program. As of June 25, 1973, over 400 NPDES permits had been issued by either EPA or the states.[85] Public hearings have been held on more than 200 permits.

**Federal Standards and Enforcement**—Besides issuing effluent guidelines which states must follow in issuing permits, EPA will promulgate effluent standards for toxic pollutant discharges from major categories of new facilities. In addition, EPA will issue regulations requiring pretreatment of industrial wastes treated by municipal systems. These and other extensive new standard-setting authorities lodged in EPA are supplemented by broad enforcement powers to abate violations of permits and of the Act itself. Thus, although the law purports to preserve the "ordinary responsibilities" [86] of states for controlling water pollution, and does in fact introduce extensive new state requirements, its dominant thrust is to enlarge the Federal role in the continuing Federal-state program.

## A Strategy for Implementation

Confronted with the complex task of cleaning up the Nation's waters under a demanding time schedule, EPA and the states must establish priorities for action—either by force of circumstances or by deliberate choice. The "Water Strategy Paper" issued by EPA last February articulates a strategy designed "to provide maximum impact on water quality."[87] It focuses primary attention on water basins and basin segments where water pollution is worst and on issuing permits to the major dischargers in these areas. The primary requirement guiding EPA and the states is the law's 1977 and 1983 deadlines. The focus on major dischargers reflects the fact that in most areas a relatively few major facilities produce most of the pollution (see Chapter 6, Figure 10).

EPA has set for itself and the states a goal of processing all permit applications by the Dec. 31, 1974, deadline, after which the statutory immunity from legal actions against permit applicants without permits expires.[88] Initial emphasis is to be placed on "water quality limited" segments—those in which effluent limitations based on best practicable technology are judged not sufficient to meet water quality standards. Next in priority for permits are industries not located in "water quality limited" segments but for which effluent guidelines reflecting best practicable control technology have been developed.[89] The Act requires permits only for "point sources" of pollution, such as industrial and municipal plants and animal feedlots. Therefore EPA control efforts focus on such sources rather than on nonpoint sources such as farmland runoff of soil and fertilizer.[90]

EPA's system of priorities for funding public treatment works also focuses on meeting effluent limits and ambient standards by 1977 and 1983. Although the law defines treatment works to include storm sewers and sanitary collection sewers, EPA will give priority in funding to treatment plants that must be constructed or upgraded to provide "secondary" treatment (or higher levels when required in "water quality limited" basin segments).[91]

The immediate emphasis of enforcement will be to complete pending actions and to proceed against dischargers failing to apply for a NPDES permit.[92] Permit violations, inadequate applications, oil spills, and emergency situations may also trigger enforcement proceedings.

The essence of the EPA strategy is to focus on problems whose solutions will produce the biggest payoff in water quality and for which implementation is feasible now. Concurrently, plans will be developed to deal on a phased basis with problems that are less pressing or for which data are relatively limited.

## Citizen Participation

The 1972 Amendments expanded a theme that was most notably developed in the Clean Air Act—major public participation in the law's execution, in both standard setting and enforcement. The Clean Air Amendments introduced the citizen suit into Federal environmental law, authorizing citizens not only to act as private attorneys general by suing polluters for compliance but also to sue the Administrator of EPA to carry out nondiscretionary duties.[93] This chapter's discussion of actions under the Act shows the significant impact which the latter category of suits has already had. The Clean Air Act also stresses public hearings as a precondition to state adoption of implementation plans.

The 1972 FWPCA Amendments adopted the Clean Air Act's citizen suit authority and applied the provision for public hearings to the central regulatory feature of the new law, the issuance of permits.[94] In a further effort to involve citizens, the Amendments require EPA to issue regulations to encourage and assist citizen participation in the development, revision, and enforcement of regulations, standards, effluent limitations, plans, and programs established by EPA or the states.[95] In February 1973, EPA proposed such regulations.[96]

## Lake Eutrophication

Eutrophication, aging and deterioration of lakes, has been an increasing concern. Last year's Annual Report pointed out the significant increases in recent years in the aquatic concentrations of manmade nutrients which sometimes drastically accelerate the natural process of eutrophication.[97] As discussed in Chapter 6, EPA is conducting a nationwide survey in cooperation with states to determine what lakes are eutrophic and whether phosphorus—the most controllable nutrient—is the critical or "limiting" pollutant that needs to be controlled in order to combat eutrophication. While the survey is in process, high priority is being given to combatting eutrophication where it is known to exist.

Effluent from municipal waste treatment plants is the largest single source of phosphorus in U.S. waters.[98] The primary thrust of Federal eutrophication efforts is to encourage installation of phosphorus removal facilities at those municipal plants where control of phosphorus is needed. EPA has both regulatory authority and construction funds to stimulate municipal action. A major example of its efforts to date is in the Great Lakes basin, discussed in Chapter 7. Discharges of nutrients from industry will be controlled under the permit program.

As discussed in our last two Annual Reports, a number of states and communities have imposed controls on the phosphate content of detergents, which contribute roughly one-half of the phosphates typically found in municipal sewage.[99] One such restriction, imposed by Chicago, was overturned in court during the past year. It is important to understand the basis for that decision in order to assess its potential impact on similar laws.

The U.S. District Court ruled in *Soap and Detergent Ass'n.* v. *Chicago*[100] that a Chicago ordinance banning all phosphates from detergents sold for use in Chicago unreasonably interfered with interstate commerce and thus violated the commerce clause of the Constitution.[101] That clause protects the freedom of commerce among the states and authorizes the regulation of such commerce only by the Federal Government. On the other hand, the Constitution preserves for the states "police power" to protect public health and welfare by regulations. In view of the frequent overlap of these two provisions, courts balance the conflicting national and local interests involved in a case to determine whether a particular police power restriction affecting interstate commerce is permissible.[102] Two of many factors to be considered are the seriousness of the disruption of interstate commerce and the importance of the local interest being protected.

In the *Chicago* case, the court concluded that the evidence demonstrated a serious disruption of the detergent industry's normal interstate manufacturing and distribution process. But more important, the court found virtually no evidence of actual or potential eutrophication in the waters affected by Chicago's sewage effluent. Further, phosphate levels in the Illinois River were so high that elimination of detergent phosphates would reduce the total insignificantly. Only in very heavy rainstorms are rivers receiving Chicago sewage effluent allowed to flow temporarily into Lake Michigan, and even when these backflows occur, the detergent phosphates account for only about 3 percent of the Lake's phosphate input. The court also found that the phosphate ban showed no discernible impact on algal growth in the receiving waters.

The court found Chicago unable to justify the significant impact of its ordinance on interstate commerce. The court pointed out, however, that its decision was not applicable to cases in which adverse effects of detergent phosphates can be shown. It also indicated that although there is now no eutrophication problem in the waters affected by Chicago's sewage, a similar ordinance may be justified in the future if phosphate inputs from other sources were so reduced that the Chicago ordinance "might . . . have some effect."[103]

## Protecting the Oceans

The 1972 Marine Protection, Research and Sanctuaries Act is an outgrowth of the Council's 1970 report, *Ocean Dumping—A National Policy.*[104] The "Ocean Dumping" Act and parallel provisions in the Federal Water Pollution Control Act Amendments of 1972[105] protect both U.S. ocean waters and the high seas from pollutants dumped by vessels.

The ocean dumping law prohibits disposal of radiological, chemical, and biological warfare agents and any high-level radioactive wastes in the ocean; it provides for regulation of all other dumping through issuance of permits by EPA or, in the case of dredge spoils, by the Corps of Engineers pursuant to EPA criteria. U.S. jurisdiction applies anywhere on the high seas to dumping by Government vessels and to dumping of materials that have been transported from U.S. ports. All vessels in U.S. territorial waters and the contiguous zone are also subject to U.S. controls. The law also calls for a comprehensive research and monitoring program on the effects of ocean dumping and authorizes the establishment of marine sanctuaries for recreation, conservation, and ecological purposes.

The new law is in effect. Interim regulations specifying procedures for permit applications and issuance were published by EPA in April.[106] Interim criteria for evaluating permit applications were issued in May.[107]

The criteria prohibit ocean dumping of high-level radioactive wastes; radiological, chemical, and biological warfare agents; materials whose effects on marine ecosystems cannot be determined; and persistent inert materials that will float or remain suspended, unless they are processed to sink and remain at the bottom. Also prohibited is dumping of materials containing more than trace amounts of mercury and mercury compounds, cadmium and cadmium compounds, organohalogen compounds and compounds that may form such substances in the marine environment, crude oil, fuel oil, heavy diesel oil, lubricating oils, and hydraulic fluids.

Dumping of certain other materials will be strictly regulated by special permits: all forms of arsenic, beryllium, chromium, and lead; low-level radioactive wastes; organosilicon compounds; organic and inorganic processing wastes (including cyanides, fluorides, and chlorine); oxygen-demanding wastes; petrochemicals; and organic chemicals.

EPA has designated 118 dumping sites. Most are for dredge spoils, mud, sand, and chemical wastes. Three sites are for disposal of toxic materials—off Delaware Bay and the Massachusetts coast in the Atlantic and off the Los Angeles coast in the Pacific.

A major objective of the new legislation is to prevent dumping into the ocean of pollutants that were previously discharged into U.S. internal waters or into the air but are now restricted by the Clean Air Act and the Federal Water Pollution Control Act. The new law will also prevent coastal communities with mounting solid waste disposal problems from turning to the ocean as a city dump.

The effectiveness of the new law will be enhanced by the International Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, proposed by the President in 1971 and negotiated in 1972 at a conference attended by 92 nations.[108] The Convention will go into effect after formal ratification by 15 nations. The President submitted the Convention to the Senate in February. He also transmitted to the Congress amendments to our new law—in particular to expand U.S. jurisdiction to cover U.S. flag vessels—to make it conform to the Convention.[109]

The ocean dumping law prohibits state control over activities that it regulates. Instead, a state may propose and EPA may adopt special regulatory criteria applicable to marine waters within a state's jurisdiction.[110]

In the related area of controlling marine oil pollution (discussed further in Chapter 7), a recent Supreme Court decision upheld a claim by Florida that coastal states may impose some degree of regulation concurrent with the Federal Government. The Court's unanimous opinion in *Askew* v. *American Waterways Operators*[111] held that the provision in the Federal Water Pollution Control Act permitting states to regulate oil pollution in their coastal waters[112] did not infringe on the maritime jurisdiction constitutionally vested in the Federal Government. The Court left open for decision in the context of specific disputes the question of whether particular provisions of the Florida law[113] may conflict impermissibly with Federal provisions. The FWPCA subjects shipowners and terminal facilities to liability without fault (within limits) for cleanup costs incurred by the Federal Government and authorizes the President to promulgate oil spill prevention regulations. It also permits state regulation that is "not in conflict" with this program.[114]

## Safe Drinking Water

In his 1973 State of the Union Message on Natural Resources and the Environment, the President recommended the Safe Drinking Water Act of 1973.[115] Designed to safeguard drinking water to protect health, it mandates national standards for public water supply systems. Primary responsibility for implementing and enforcing standards would remain at the state and local level. A major emphasis is placed on informed citizen action. The bill requires that water suppliers notify the public of all standards violations and authorizes citizen suits in Federal courts to secure compliance. The proposed legislation goes even further than existing environmental protection laws in emphasizing both legal and political action by informed citizens. The Senate passed safe drinking water legislation in June. Although similar to the Administration proposal in most respects, the Senate bill placed its reliance on administrative regulation and enforcement rather than on citizen action.[116]

WATER UNFIT FOR HUMAN
USE. CONTAMINATED.
DRINK AT YOUR OWN
RISK. BOIL TO DRINK

The President has proposed legislation to establish Federal standards for drinking water.

## Summary

Unlike the Clean Air Act, which has moved squarely into the implementation phase in the 2½ years since the 1970 Amendments, the new water quality legislation has yet to be translated into concrete actions. EPA has issued many of the basic regulations, however, and the effects of the new law will soon be felt. Like the Clean Air Act, the new water law establishes a Federal-state program with explicit requirements for standards and specific deadlines. With limited exceptions, such as the proposed legislation to safeguard drinking water, the Nation now has a legal framework for improving water quality.

In contrast to the national response to the Clean Air Act in early 1971, there has been more debate about some provisions of the water quality legislation.[117] Much of this debate centers on the no-discharge and universal swimmable waters objectives and the related strategy for the 1977–83 period, in particular, the call for industry to employ "best available technology economically achievable by 1983."

The Congress required the National Study Commission to report by October 1975 on "all aspects of the total economic, social, and environmental effects of achieving or not achieving the effluent limitations and goals . . . for 1983." [118] Thus, although the Congress set forth a long-term water quality strategy in P.L. 92–500, it also provided for an interim review of the law's implications.

The requirements of the new law raise questions concerning the ability of EPA, state agencies, and dischargers to meet the demands placed upon them. The desirability of clean water cannot be disputed, but the requirement that some 60,000 industrial, municipal, and other facilities be given permits and achieve compliance by 1977, for example, raises severe practical problems. The EPA Administrator has indicated that regardless of the amount of funds available, it is unlikely that all public waste treatment facilities can achieve secondary treatment as required by 1977. Such candor, coupled with the maximum efforts of all parties, is essential to making the most progress possible while not misleading the public to expect miracles.

## Hazardous Pollutants

From the diverse spectrum of contaminants to man and the environment, environmental protection laws designate some as "hazardous" or "toxic" and set them apart from "ordinary" pollutants for special regulatory treatment. Although precise distinctions are impossible—for example, ordinary oxygen-demanding organic matter can kill fish by robbing them of oxygen—a "hazardous" pollutant is generally defined as one which can directly cause death or serious irreversible or incapacitating disease or behavioral abnormalities or carcinogenic, teratogenic, mutagenic, or other long-term effects in man.[119]

The Federal pesticide control laws dating back to 1910 [120] and the Atomic Energy Act of 1954 [121] show early recognition of the need to regulate the sale or use of hazardous materials in order to protect the environment from contamination. But it is ironic that despite widely reported problems involving environmental exposure to hazardous substances in recent years—including mercury, lead, and PCB's—more than 2½ years have passed since the President first proposed comprehensive legislation to regulate the many toxic substances whose manufacture and use are not covered by law. The 92d Congress came very close to final action last year in the waning days of its second session, but the Nation still lacks the needed legislative authorities.

This section briefly assesses the status of Federal programs and proposals for controlling hazardous substances whose misuse can endanger man and other living organisms. Specifically, it covers pesticides, toxic substances, and radiation.

## Pesticides

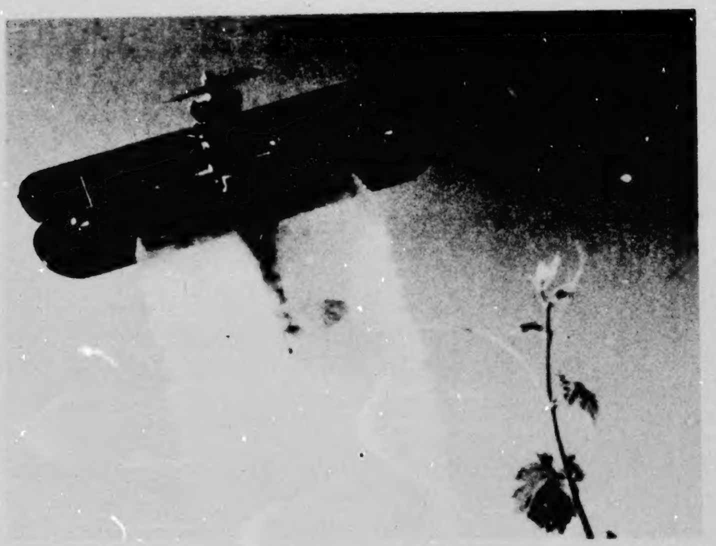
More than 32,000 pesticide products, containing nearly 1,000 chemicals, are now registered for use in the United States.[122] To be registered by the Federal Government, a pesticide must be determined not to be hazardous to health or the environment when used as directed. In some cases, however, new data reveal previously unknown hazards. In 1972, the Administrator of EPA virtually banned DDT. EPA also limited use of other persistent pesticides.[123]

With DDT sales now prohibited, new priorities have emerged for minimizing the adverse environmental effects of pest control. Further studies are needed on the effects of other persistent pesticides. Controls must be placed on the circumstances and techniques for application of chemicals remaining in use. Less persistent but more acutely toxic pesticides being used to replace DDT and similar compounds must be controlled to minimize poisonings from accidents, mishandling, and field exposure. The concept of integrated pest management, which minimizes the use of chemicals, must be further stimulated. These are the priorities on which EPA, the Departments of Agriculture and Labor, and other agencies are fixing their attention.

**A New Pesticide Law**—On Oct. 21, 1972, the President signed the Federal Environmental Pesticide Control Act (FEPCA),[124] a law containing most of the provisions of the original Adminstration proposal. FEPCA substantially amends the Federal Insecticide, Fungicide, and Rodenticide Act of 1947 (FIFRA).[125] It strengthens and expands the authorities provided by FIFRA in several respects. Most notably, it extends regulatory authorities from labeling to the use of products, authorizes classification of chemicals for restricted use only, streamlines administrative procedures, and extends controls to products sold only in intrastate commerce.

The old FIFRA controlled only the labeling of pesticides and restricted the registration of any chemical which, when used in conformity with label instructions, would be hazardous to man or the environment. FEPCA, in contrast, makes it unlawful for anyone (including the Federal Government) to use a pesticide contrary to label instructions.

Under the new Act, pesticide products may be classified for "general" or "restricted" use. A restricted use pesticide may be applied only by a certified pesticide applicator—an individual trained in the application and potential effects of pesticides in an EPA-



Application of some pesticides is now regulated under Federal legislation.

approved state program. The Administrator of EPA is empowered to place whatever other constraints on restricted-use pesticides he deems necessary. A general use pesticide may be applied by anyone provided the use conforms with label requirements.

FEPCA simplifies the previous procedure for canceling and suspending pesticides registrations. It also authorizes the registration and inspection of manufacturers and processors of pesticides and the regulation of pesticide packaging and disposal.

**Implementation of the Law**—The various provisions of FEPCA go into effect over a 4-year period. Corresponding sections of the old FIFRA remain in effect until replaced. EPA issued implementation plans for the new law last January.[126]

Section 3, which extends Federal registration requirements to the use of products in intrastate commerce, was not required to be put into effect until October 1974.[127] But the Administrator determined that large-scale intrastate use of unregistered or canceled products, particularly those containing DDT, might otherwise occur. EPA therefore implemented the provisions of section 3 with respect to DDT products on April 10 of this year.[128]

**Regulatory Actions**—As of Dec. 31, 1972, EPA banned all major uses of DDT, a chlorinated hydrocarbon compound which, because of its persistence and accumulation in the environment, has seriously damaged birds, fish, and other organisms in the food chain. The order, announced on June 14, was based upon the Administrator's determination that continued DDT use would pose an unacceptable risk to man and the environment.[129] With the cancellation order and implementation of section 3 of FEPCA, nearly all uses of DDT have been terminated.

The DDT ban is expected, in some cases, to cause the use of substitutes that are more acutely toxic to man. Their use raises the threat of more pesticide poisoning, especially in the Southeast, where many cotton farmers are accustomed to using DDT and are unfamiliar with the more acutely toxic substitutes. More poisoning reports are also likely to be filed during this growing season because of an improved accident reporting system and considerable publicity given the problem.

EPA and the Cooperative State Extension Service of the Department of Agriculture are attempting to reduce the threat of pesticide poisonings which may result from the use of more toxic chemicals. "Project Safeguard" is designed to educate farmers, particularly those with farms of 30 acres or less. It will also alert the medical profession to procedures for working with the more toxic chemicals and for detecting early signs of poisoning. The effort is centered in 14 states, primarily in the Southeast, which accounted for over 85 percent of DDT use.[130]

On April 20, 1973, the Federal Appeals Court in St. Louis dissolved a District Court injunction which, because of a dispute over FIFRA procedures, had temporarily prevented EPA from completing cancellation proceedings on several uses of the herbicide 2,4,5-T.[131] When manufactured without proper quality controls, this herbicide has been found to contain excessive levels of a class of extremely toxic chemicals called dioxin. EPA will reopen the cancellation proceedings.

**Field Reentry Standards**—The Occupational Safety and Health Act [132] provides for both temporary emergency and permanent standards to protect workers. The Federal Environmental Pesticide Control Act [133] also provides for the protection of human health. On April 30, 1973, the Secretary of Labor issued temporary emergency standards to protect farmworkers from exposure to hazardous pesticides. Development of standards for reentry—the time following application of a pesticide during which laborers may not enter the fields to work—had been ordered by the President in his 1972 Environmental Message. The temporary regulations establish standards and require recordkeeping and the posting of warning signs after pesticide application. The reentry standards originally covered 21 organophosphate insecticides used on tobacco, apples, grapes, peaches, lemons, oranges, and grapefruit. This class of pesticides contains some of most toxic chemicals used for pest control. The regulations were subsequently revised to reduce reentry times and to cover only 12 rather than 21 pesticides. On July 10, the Fifth Circuit Court suspended implementation of the temporary regulations "pending further order" of the court.[134] The Government has appealed, and in the meantime the Department of Labor and EPA are cooperating in the preparation of permanent standards to be established under regular rulemaking procedures.

**Integrated Pest Management**—In order to minimize further the adverse environmental effects of the use of pesticides, the President in his Environmental Message of 1972 initiated a program to encourage the development and use of alternative methods of pest control. In January 1973 the Council released *Integrated Pest Management*, a report describing the rationale and benefits of the new Federal program.

Integrated pest management maximizes natural controls of pest populations. It is based upon knowledge of each pest, its environment, and its natural enemies. Farming practices are modified to control the potential pest and to aid its natural enemies. "Scouts" monitor the fields to determine population levels of the pest, its natural enemies, and important environmental factors. Only when the pest concentration is likely to reach a level high enough to cause significant crop damage are suppressive measures taken. Such measures might include releasing biological control agents or pest-specific diseases or, when necessary, applying pesticides in limited amounts. Measures are selected to control the pest with minimum disruption to its natural enemies.

The CEQ study on integrated pest management showed that often this approach provides better pest control at lower cost and with significantly fewer environmental problems than reliance on chemical pesticides alone. In addition, integrated pest management offers a solution to the growing problem of pest immunity to chemical pesti-

A field scout surveys a boll weevil trap as part of an integrated pest management program.

cides. The acute susceptibility to pests of crops grown by monoculture farming is a further stimulus for using these techniques.

The Federal integrated pest management program includes research, field tests, and development of training programs. During the first growing season, new control methods were demonstrated on apples in Michigan and Washington, alfalfa in Indiana, potatoes in Idaho, sweet corn in Maryland, and beans and peppers in Delaware and New Jersey. For the 1973 growing season, the program has been extended to cover pears in California; citrus in Florida; corn in Illinois, Indiana, Idaho, Missouri, Nebraska, and Ohio; grain sorghum in Kansas, Nebraska, Oklahoma, and Texas; apples in New York and Pennsylvania; peanuts in Oklahoma and Texas; and alfalfa in Washington. The private sector also carried out insect scouting on a number of crops in several regions. Participating farmers contributed to the salaries of scouts who monitored more than 3,366,000 acres of cotton,[135] about one-fourth of the total U.S. cotton acreage.

Exchanges of techniques and cooperative pest management development projects are the top priority agricultural programs under our Environmental Agreement with the USSR. A team of Soviet specialists will visit the United States to review important pest management research and field operations. A U.S. delegation will attend an International Conference on Pest Management in the Soviet Union this year. Cooperative research on promising techniques is expected to begin after the U.S. visit by Soviet specialists.

The Federal program to stimulate integrated pest management and the new pesticide law's provision for limiting the use of some pesticides to licensed applicators will encourage the development of the pest management service industry. The industry already exists in California and parts of Arizona and Texas. Nearly 30 small companies sell their services on a per-acre basis. The viability of this small but expanding industry is a measure of its potential. In California, cotton, citrus, and grape farmers using these private integrated pest management firms increased net profits before taxes by 22 percent.[136] Several Land Grant universities are initiating special integrated pest management training programs.

## Toxic Substances

**Pending Legislation**—A 1971 CEQ report highlighted the need for legislation to control environmental contamination for which air and water pollution regulation was inadequate.[137] Based on our report, the Administration submitted to the Congress in February 1971 a bill to regulate toxic substances.[138] The proposed Toxic Substances Control Act would empower the Administrator of EPA to restrict or prohibit the use and distribution of any commercially produced chemical substance if necessary to protect human health and the environment.

The Administrator would also be empowered to prescribe guidelines for tests that manufacturers must perform prior to marketing certain types of new chemicals.

On May 30, 1972, the Senate passed a bill embodying most of the features of the President's proposal. In October, the House passed a somewhat modified version, but the Congress adjourned before the differences could be resolved.[139]

The President submitted a stronger bill in February.[140] It would empower the EPA Administrator to request testing on existing chemicals and would allow the requirements of the Act to be extended to processors in addition to manufacturers. Committees of both Houses have held hearings on the legislation.

Anticipating passage, EPA established an Office of Toxic Substances. It is working on ways to identify those characteristics of chemical substances that are most likely to imperil human health or the environment—such as persistence or the ability to cause birth defects. The office is also working to identify methods for testing the health and environmental effects of specific substances and to identify the degree of risk involved in their use.

**PCB's**—Last year's discoveries of hazardous levels of polychlorinated biphenyls (PCB's) in fresh poultry were the latest in a series of events underlining the urgent need for enactment of toxic substances control legislation. Earlier incidents included the mercury episodes in 1970 and 1971 and the detergent industry's voluntary agreement in 1970 to stop the use of NTA (nitrilotriacetic acid) pending further tests to determine its potential health effects.

Because of the persistence and adverse biological effects associated with PCB's, a Federal task force headed by CEQ and the Office of Science and Technology in May 1972 recommended discontinuing all uses of PCB's except in electrical capacitators and transformers. At the same time, EPA announced that it would reject water quality permit applications from any industry whose discharges raised ambient PCB levels in rivers and lakes to 0.01 or more parts per billion.[141] The Food and Drug Administration has issued regulations establishing limits for PCB's in food and food packaging and preventing contamination in food plants.[142]

The major U.S. producer of PCB's, the Monsanto Company, voluntarily limited sales of these chemicals to use in capacitators and transformers. But there is no legal authority to prevent other manufacturers, either domestic or foreign, from supplying PCB's for any use.

In February 1973, the Organization for Economic Cooperation and Development, which represents Japan, Australia, and the industrial nations of Western Europe and North America, adopted a directive calling upon all member countries to limit the use of PCB's to transformers, capacitators, heat transfer fluids (in other than food, drug, and feed operations), and hydraulic fluids for mining equipment and also to control the manufacture, import, and export of products containing PCB's. This is the first international agreement limiting the use of an industrial chemical for environmental reasons.[143]

**Haloethers** Although PCB's have received considerable public attention, this class of compounds may represent only a fraction of the toxic substances problem. For example, a less publicized group of chemicals, the chloroethers, may be a significant water pollutant and drinking water contaminant.

Recent reports have found *bis*-chloroethyl ether and *bis*-chloroisopropyl ether in some water samples, including treated drinking water.[144] Little quantitative information is available, however, and the source of the chemicals is not firmly established.

Both compounds are closely related chemically to *bis*-chloromethyl ether (BCME), which is known to produce cancer in mice. In the past year the Department of Labor has issued occupational standards for BCME to protect workers from the threat of cancer. *Bis*-chloroisopropyl ether has not been tested for chronic toxicity. *Bis*-chloroethyl ether has been studied only briefly, but initial results indicate that it too may be carcinogenic.[145]

New substances are being produced each year whose potential toxicity is unpredictable. If released into the environment, they may cause significant health or environmental problems. The proposed Toxic Substances Control Act is needed to ascertain and control the distribution and use of chemicals with hazardous properties.

## Radiation

The past year has witnessed significant efforts to reevaluate the adequacy of public protection from the effects of ionizing radiation. Late in 1972, the National Academy of Sciences (NAS) completed its review of what we know about the effects of ionizing radiation on man.[146] EPA completed its program strategy for standard setting.[147] The Atomic Energy Commission held public rulemaking hearings on radioactive effluents from light water nuclear powerplants and on the emergency core cooling systems designed to prevent major radioactive release in case of failure in a reactor's primary cooling system. In addition, as part of the environmental impact analysis for individual powerplants, the AEC initiated hearings on methods for considering environmental impacts of the entire nuclear power fuel cycle.

It is well known that excessive exposure to ionizing radiation can cause death or ill health in man and damage to the environment. However, the effects of such radiation at low environmental levels, such as those currently experienced or allowed by existing standards, have not been well understood. Work culminating in the past year helps to clarify this issue. Two issues that continue to receive considerable public attention are reactor safety in the event of a cooling system failure and disposal of high-level radioactive wastes. Thus, although continuous radioactive discharges from nuclear powerplants and associated fuel processing facilities represent far less than 1 percent of the population's total exposure to manmade radiation (and will continue to do so over the next few decades despite projected increases in such facilities),[148] nuclear power remains a significant potential environmental issue.

**Exposure Standards**—The NAS study estimated that in 1970 the U.S. population was exposed to an average of approximately 182 millirems per year from all sources of radiation (see Table 1). The sources of this exposure were: 102 millirems from the natural background (cosmic rays from space, natural radiation in rocks and soil, etc.), 73 millirems from medical exposure (x-rays, etc.), and 4 millirems from fallout caused by atmospheric tests of nuclear weapons. Of the remaining 3 millirems, most was from miscellaneous sources (television, air travel, etc.). Occupational exposures (0.8 millirems) and exposures from nuclear powerplants (0.003 millirems) amounted to a very small fraction of the total.[149]

The current EPA guideline for maximum acceptable whole-body exposure of average population groups to manmade sources of ionizing radiation (excluding medical and occupational exposures) is 170 millirems per year. The guideline for an individual is 500 millirems per year.[150] The actual annual whole-body exposure experienced by average population groups from manmade sources—i.e., from fallout, nuclear powerplants, and certain miscellaneous sources—is less than 6 millirems, or about 3.5 percent of the 170 millirem limit.[151]

The NAS report estimates that if over a 30-year period the population were to receive annually additional radiation up to the full 170-millirem limit permitted by current guidelines, an estimated additional 3,000 to 15,000 cancer deaths would occur annually. The most likely figure is 6,000, an increase of about 2 percent in the spontaneous cancer death rate.[152]

The NAS study recognized that the guideline was based on "an effort to balance societal needs against genetic risks" but concluded that "it appears that these needs can be met with far lower average exposures and lower genetic and somatic risks," and thus "the current guide is unnecessarily high." [153]

EPA, as the successor to the Federal Radiation Council which established the current guidelines, is reviewing the NAS recommendations and will use them as the basis for an expected revision of environmental standards.

The philosophy of EPA, AEC, and Food and Drug Administration programs—that hazards should be estimated on the assumption that there is no threshold level below which human beings will not be adversely affected by exposure to radiation, thus exposures should be minimized—is supported by the NAS study. It urged that the accepted concept of balancing the risks of low-level exposures

**Table 1**

## Estimated Average Annual Whole-Body Exposure of the General U.S. Population to Ionizing Radiation for 1970

| Source | Average dose rate[1] millirems per year |
|---|---|
| Environmental | |
| Natural | 102 |
| Global fallout | 4 |
| Nuclear power | 0.003 |
| Subtotal | 106 |
| Medical | |
| Diagnostic | [2] 72 |
| Radiopharmaceuticals | 1 |
| Subtotal | 73 |
| Occupational | 0.8 |
| Miscellaneous | 2 |
| Subtotal | 3 |
| Total | 182 |

[1] The numbers shown are average values only. For given segments of the population, dose rates considerably greater than these may be experienced.

[2] Based on the abdominal dose.

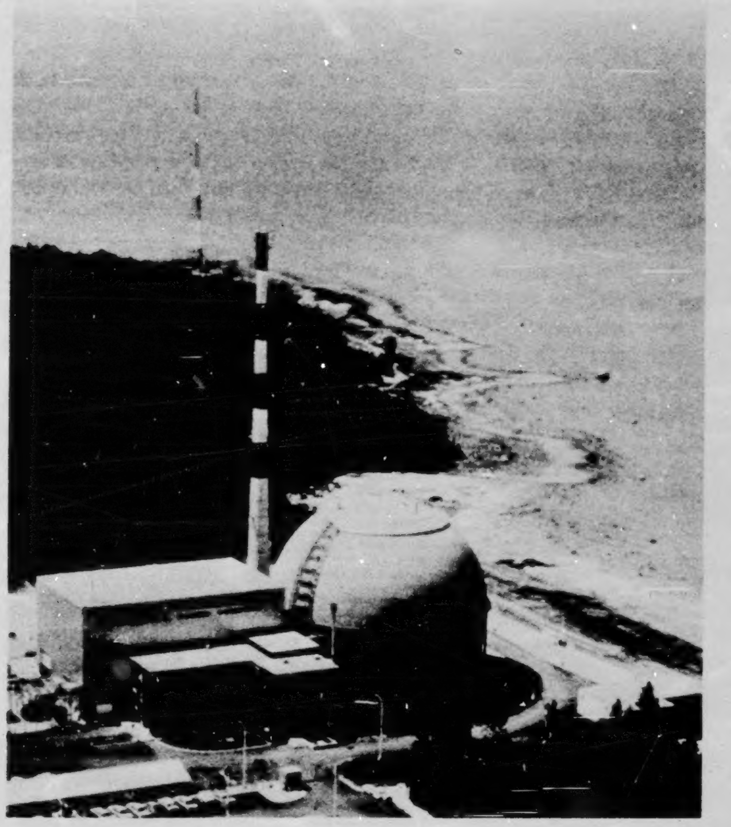
Source: National Academy of Sciences-National Research Council, Advisory Committee on the Biological Effects of Ionizing Radiations, "The Effects on Populations of Exposure to Low Levels of Ionizing Radiation" (Washington: National Academy of Sciences-National Research Council, 1972), p. 38

against anticipated benefits (e.g., supplying electric energy, providing medical treatment) be translated into specific operational guidance through cost-benefit analyses and quantitative risk estimates. The study indicated that risk estimates are preferable to no quantitative analysis, although admittedly they are often uncertain.

**Discharges from Nuclear Powerplants** The EPA guidelines apply only to manmade sources of radiation other than medical exposures. Therefore, the guidelines relate primarily to the nuclear power generation system—to uranium mines and mills, fuel fabrication and reprocessing plants, nuclear power reactors, and waste depositories. The AEC, which regulates the fuel plants, reactors, and depositories, seeks not only to meet the environmental standards set by EPA but to keep emissions, as far as practicable, well below the standards.

Radioactive releases from nuclear powerplants generally have been held to a small percentage of the AEC emission limits based on existing environmental standards. Nevertheless, these standards have frequently been challenged by claims that the population may be subjected to unwarranted risks.

Regulations adopted by the AEC in December 1970 on design objectives and operating conditions were set to keep releases of radioactivity from light water power reactors at the "lowest practicable level." [154] These requirements, however, were not quantitative. In June 1971, the AEC proposed amendments to its regulations which attempted to quantify the lowest practicable level. The levels of public exposure under the proposed regulations are only a small fraction of natural background radiation; they are even within



This nuclear powerplant on Lake Michigan is subject to new radiation protection guidelines.

annual variations in the natural background radiation at any location in the United States. The proposed AEC regulations establish reactor design objectives intended to limit exposure of individuals living near nuclear powerplants generally to less than 5 millirems per year, the equivalent of 5 percent of background radiation and 1 percent of current radiation protection guidelines. Exposures of sizable population groups would generally be less than about 1 percent of background or about 1 millirem.

The proposed regulations were the subject of rulemaking hearings in 1972. The hearings were recessed after more than 2,800 pages of testimony, and the AEC prepared an environmental impact statement on the proposed quantitative guidance. The final statement was issued in May 1973.[155] The Commission will soon take final action on the proposed amendments.

**Emergency Core Cooling Systems**—Emergency core cooling systems (ECCS), together with issues such as fuel densification, reactor containment, and reactor siting, are the major elements in nuclear reactor safety. In June 1971, the AEC issued interim criteria for the ECCS in light water nuclear powerplants.[156] The criteria, which contained general performance requirements for the reactors and requirements for implementation, were amended in December 1971 to include additional evaluation models—computer models and associated assumptions and procedures—for analyzing the performance of the systems.

In 1972 and early 1973, the AEC held extended public rulemaking hearings on its ECCS criteria. Their purpose was to elicit advice from the public and the nuclear industry on whether the interim criteria should be retained or modified. Participants in the hearing included the four light water reactor vendors; the Consolidated Utilities; the Consolidated National Intervenors; the Lloyd Harbor Group; and the States of Maine, Minnesota, Pennsylvania, and Vermont.

Emergency core cooling systems are installed in nuclear reactors to ensure that heat can be removed from the reactor core in the unlikely event that the normal core coolant is lost. The emergency systems must be capable of safely limiting the consequences of any loss of coolant. In such an accident, the danger is that the fuel rod covering may break because of overheating, causing radioactive material from the reactor fuel to escape into the containment building and leak into the environment. Without adequate emergency cooling, there would be substantial additional core damage, possibly leading to melting of the entire core. That might cause the release of additional radioactive vapors as airborne particulates.

At the hearing, several citizen groups raised substantial questions concerning the official AEC position. The Commission made available for questioning members of the AEC regulatory staff and AEC contractors, whose views differed from those presented in the official regulatory staff testimony.

Supplemental testimony filed by the AEC staff in October 1972 proposed increased conservatism on some of the ECCS criteria, particularly the acceptable temperature limit for the covering of the hottest single fuel rod in the reactor and for the assumptions used in calculating the temperature of the rod covering.

On December 7, 1972, the regulatory staff issued for comment a draft environmental statement on the interim ECCS criteria. A final statement was filed with the Council on Environmental Quality in May.[157] Requests have been made to question AEC staff on matters raised in the statement, and the ECCS hearing will be resumed for this purpose. After the hearings, the AEC will decide on the criteria.

For both the ECCS and radioactive discharge issues, the AEC adopted a relatively new technique—it held general rulemaking hearings to resolve in one proceeding a number of complex technical issues that would otherwise have been raised repeatedly in many individual adjudicatory proceedings. This new rulemaking approach appears to have advantages for both the Government and environmental groups, who can thereby concentrate and consolidate their efforts on basic issues. Individual license hearings can then focus on problems peculiar to a particular facility.

In May 1973, a lawsuit was filed against the AEC to enjoin the further operation of 20 nuclear powerplants licensed by the agency.[158] It was claimed that the reliability of the ECCS in these plants is insufficient to provide the "adequate protection to the health and safety of the public" required under the Atomic Energy Act.[159] The court granted summary judgment for the AEC and dismissed the case, simultaneously denying an associated motion for a preliminary injunction. The grounds for the dismissal were that, in view of the pending ECCS hearings, the petitioners had failed to exhaust their administrative remedies first and that the court did not have jurisdiction over the case. Plaintiffs appealed in the case, which is now pending in the District of Columbia Court of Appeals.[160]

**Nuclear Fuel Cycle**—The AEC has also used the rulemaking hearing to deal with the environmental effects of the nuclear fuel cycle, which embraces all the processes except nuclear powerplant operations, including mining, fabrication, reprocessing, transportation, and disposal. Because each newly licensed powerplant increases the level of fuel cycle activity, the question has arisen in several licensing proceedings whether the environmental effects of the increased fuel cycle activity should be considered in the cost-benefit analysis that is used in determining whether to grant construction permits and operating licenses for particular plants. In November 1972, the AEC addressed this issue in a survey of the impact of the nuclear fuel cycle on the environment.[161]

The AEC survey proposed two alternative amendments to the AEC regulations governing licensing of nuclear powerplants.[162] Under the first alternative, each analysis of the environmental effects of proposed light water nuclear reactors would consider only the environmental impacts of the nuclear powerplant itself and the effects of transporting nuclear fuel to the reactor and radioactive wastes from the reactor to depositories. The second alternative would require an analysis of the total fuel cycle impact in the environmental cost-benefit analysis of each proposed reactor. If this second alternative were adopted, the data on total fuel cycle impacts developed in the AEC would be used in the individual powerplant environmental cost-benefit analyses.

**Medical Exposure**—As mentioned above, the average exposure of the U.S. population to radiation from other than natural background and medical sources is an exceedingly small portion of total exposures. The primary manmade—i.e., controllable—source is medical radiation. Its use is increasing, but it is not presently subject to regulation.

The NAS report stated that medical radiation "can and should be reduced considerably by limiting its use to clinically indicated procedures utilizing efficient exposure techniques and optimal operation of radiation equipment." [163]

The report indicated that using improved equipment, properly shielding reproductive organs, and eliminating unnecessary x-rays could reduce by 50 percent the "genetically significant dose" currently received by the general population.[164] Among sources of exposures listed as probably unnecessary were mass screening for tuberculosis, lung cancer, and gastric cancer; routine x-rays of food handlers; and "possibly" mass screening for breast cancer in women. The committee suggested that x-ray exposure could best be reduced through voluntary action by the medical profession and by regulating the design of equipment responsible for medical exposures.[165] The Food and Drug Administration's performance criteria for diagnostic x-ray systems and their major components are having a significant effect on the manufacture of these systems. FDA's expanded training and educational efforts in this field are also reducing patient exposures.

## Noise

Noise affects all urban residents—in factories, in offices, near construction sites, at places of recreation, and even at home. In the past, noise was almost exclusively a local problem. Early municipal ordinances prohibited noise considered excessively or unreasonably loud. They focused on auto horns, steamboat whistles, radio loudspeakers, and sound trucks. In more recent years, the number and character of sources of noise have changed. As instruments for quantitative meas-

Recent legislation authorizes EPA to regulate major sources of noise.

urement of noise have been developed, precise numerical limits have replaced general restrictions in noise control regulations.

Noise was long accepted as a necessary though sometimes unpleasant part of living. Now it is regarded as a controllable pollutant which should be regulated. This new attitude is reflected in the Noise Control Act of 1972.[166] The Act calls for extensive Federal regulation of major noise sources, preempting to some extent state and local controls. The resulting interplay among the levels of government will be an important feature in the success of noise control efforts in future years.

The Noise Control Act of 1972 gives the Federal Government a major new role in controlling noise problems. Regulation over new products is made a Federal responsibility. But there is still room—and need—for vigorous local action. Federal controls, except those for aircraft, trucks, and railroad operations, apply only to the noise emissions of products, not to the time, place, or manner of their use. For example, although Federal regulation will cut the noise generated by new construction equipment, local regulation and enforcement will still govern its maintenance and set the hours for its use. Communities may also wish to restrict traffic and other noise-generating activities at times.

## Transportation Noise

The most significant source of noise is transportation—airplanes, automobiles, trucks, buses, and railroads.[167] For several years there has been Federal authority to regulate aircraft noise. With enactment of the Noise Control Act last year, the Federal Government received an expanded charter to control not only noise from aircraft and other modes of transportation but also the other major noise sources that affect interstate commerce, such as construction equipment.

The first Federal legislation expressly aimed at controlling noise was the 1968 amendment to the 1958 Federal Aviation Act. It gave the Administrator of the Federal Aviation Administration broad authority to prescribe standards for measuring and controlling civilian aircraft noise and sonic boom.[168] Pursuant to this authority, the FAA established noise emission standards for all new types of nonmilitary subsonic jet aircraft. The FAA had indicated its intention to adopt noise emission limits for supersonic transport and V/STOL aircraft (designed for vertical or short takeoff and landings) and for retrofitting aircraft already in use.[169]

The Noise Control Act of 1972 directs the Environmental Protection Agency to conduct a thorough study and report to the Congress by July 27, 1973, on the aircraft and airport noise problem, including assessment of current FAA flight and operational noise controls, noise emission controls and possibilities for retrofitting or phasing out existing aircraft, possibilities for establishing cumulative noise level limits around airports, and control measures available to airport operators and local governments. Following completion of the report, EPA is directed to propose for adoption by the FAA any regulations on aircraft noise and sonic boom that are necessary to protect public health and welfare. Then will follow an elaborate bureaucratic ballet.

The FAA is required to publish and hold hearings on the proposed regulations. Within a reasonable time after concluding its hearings and consulting with EPA, the FAA must either adopt the EPA regulations, as proposed or modified, or explain in the *Federal Register* why it has failed to do so. If EPA concludes that an FAA modification of its proposed regulations or a decision not to adopt a regulation does not protect the public health and welfare, EPA may ask the FAA to review and report to it on the advisability of prescribing the EPA-proposed regulation. In response, the FAA is required to identify the factors leading to its conclusions, including any environmental impact analysis. If the FAA indicates that it will not adopt the EPA recommendations and that it has not done an environmental impact comparison of the EPA and FAA alternatives, EPA may request the FAA to publish a supplemental report doing so.[170] Finally, however, the FAA may make the decision to promulgate regulations with or without EPA's concurrence.

Aircraft noise associated with airport landings and takeoffs is a major environmental problem for many communities, particularly where airports are sited near community activities. Because of the extensive Federal authority to regulate aircraft operations, air traffic, and the use of airspace, courts have frequently struck down local attempts to control aviation noise on the basis of preemption of Federal law.

It is clear that not all local regulation is preempted. Thus, while local regulations on the permissible noise levels of all overflying aircraft or on the use of navigable airspace have been held to be inherently inconsistent with the Federal Aviation Act,[171] until recently local governments have been held to have some powers to curb noise by controlling airport operations nondiscriminatorily and consistent with rules adopted by the FAA for such operations.[172] The Noise Control Act of 1972 was not intended to alter this preexisting alignment of Federal and local authorities.[173]

In May the Supreme Court, in *City of Burbank* v. *Lockheed Air Terminal, Inc.*, held that a locality can control airport noise only as proprietor of the airport being regulated and not through the exercise of its general constitutional police power to protect public health and welfare.[174] The 5-to-4 decision, based on Congressional language referring to localities as proprietors, stands in sharp contrast to another recent Supreme Court decision [175] upholding a state's police power authority to regulate oil pollution in coastal waters, another subject heavily regulated under Federal law.

The Lockheed Air Terminal, located in Burbank, Calif., is apparently the only major privately owned airport in the Nation. However, the Supreme Court decision appears to preclude local control in another category of cases—those in which an airport located in one local jurisdiction is owned by another. For example, the Cincinnati airport is located in Kentucky.[176] Unless overturned by the Congress, the Burbank decision leaves jurisdictions containing airports that they do not own with very limited ability to protect themselves from airport noise. The Court's decision was contrary to a friend-of-the-court brief filed by the Department of Transportation.

Noise from other modes of transportation—autos, trucks, and buses—until recently has been regulated, if at all, at the state and local levels. Most local laws seek to reduce engine exhaust noise by requiring mufflers. Some localities have tried to restrict the use of various types of vehicles in certain areas to specific times of the day by controlling their speed or by excluding them altogether.

In recent years, some state and local governments have specified permissible noise levels for vehicles operating at different speeds. In addition, a few local governments have prohibited the sale of new vehicles that produce noise above specified levels.[177]

The Noise Control Act of 1972 preempts state and local governments from establishing noise emission standards applicable to the sale of new vehicles. It follows the precedent of the Clean Air Act by requiring EPA to set national standards.[178]

The Act also contains special provisions requiring EPA to establish noise emission limits for the operation of railroads and motor carriers engaged in interstate commerce and directing the Department of Transportation to issue regulations ensuring compliance. The EPA regulations will supplement those which may be adopted for new trucks, buses, and railroad equipment. The Act prohibits state and local regulation of noise from these sources unless it is identical to Federal standards. State and local regulation is permitted, however, if required by special local conditions and if determined by EPA not to conflict with its regulations.[179]

## Noise from Other Products

The EPA-DOT/FAA authorities for regulating transportation noise sources are part of a broader mandate under the Noise Control Act to set emission standards for new products which are major noise sources and for which standards are feasible—construction equipment; transportation equipment, including any in which an engine or motor is an integral part; and electric or electronic equipment. The Administrator of EPA must promulgate initial noise limits for products in these categories by October 1974. He has discretionary authority to regulate any other product whose noise may endanger public health or welfare.[180]

The Noise Control Act empowers EPA to require that manufacturers label any product that emits noise capable of adversely affecting public health or welfare. EPA may also require labeling of products effective in reducing noise.

Since 1971, the Department of Housing and Urban Development has followed a policy that prohibits HUD financial support for construction on sites that produce unacceptable noise exposures as defined by standards issued by the Department.[181]

A successful effort to reduce noise will require Federal, state, and local action. Noise emissions should be substantially reduced over time as Federal standards for new equipment take effect. But to be fully effective Federal standards must be complemented by state and local restrictions on the time and manner in which equipment is used. Continuing action at the local level, such as New York City's new noise control code,[182] suggests that the new Federal controls will supplement rather than supplant local programs.

## Solid Wastes

The solid waste problem is really a series of problems related to the staggering volume of products and other objects discarded after use. Solid wastes range from newspapers and grapefruit rinds to abandoned automobiles and demolition debris. Solid wastes pose potential pollution problems, such as ground water leachate from land dumps and air emissions from incinerators. They create aesthetic eyesores such as litter on roads and in parks and the blight of open dumps. They can create resource depletion problems because of the failure to recover waste materials whose reuse can perpetuate reserves of such virgin resources as timber and iron ore. And for municipalities that spend about $5 billion each year for collection, processing, and disposal, solid wastes are a major financial problem.[183]

Since 1965, the Federal Government has helped communities find new solutions for their solid waste problems through research, analysis, demonstration of new technology, and technical assistance.[184] Although the solid waste problem remains significant, the impact of EPA's efforts over the past few years is now being felt and can be expected to increase as more communities and states adopt new techniques.

In the past 3 years, EPA grants and activities have stimulated development of new technologies for the recovery of wastes; have contributed to research, development, and implementation of improved methods of collection and disposal; have helped close thousands of open burning dumps; and have developed and demonstrated management tools to maximize the efficiency of operations. This section reviews some of the major developments in solid waste management

Open dumps are being closed or converted to sanitary landfills.

over the past year and discusses the state of the art in solid waste management.

For the most part, urban solid waste is a local or regional problem. In the past, the Federal role has been to identify and test possible solutions, but implementation generally rests with state and local governments. Accordingly, the Administration has proposed to reduce Federal spending for solid wastes.[185] However, the Federal Government continues to stimulate recycling by purchasing recycled materials [186] and by seeking to eliminate discriminatory treatment of recycled materials in such areas as Government-approved interstate transportation rates.

## Hazardous Wastes

Although there are Federal laws controlling release of hazardous materials to the air and water, there are no laws directly governing their disposal on or under the land. The unregulated disposal of hazardous wastes is a national problem, related primarily to industries in interstate commerce. This serious regulatory gap significantly threatens human health and other living organisms. The severity of the problem is illustrated by just two examples.[187] In Perham, Minn., arsenic buried on agricultural land about 30 years ago caused the hospitalization of several people who drank water contaminated by it. In the San Francisco Bay area, 50 tons of organic lead produced each year from alkyl lead manufacturing was disposed of in ponds at an industrial waste disposal site. In attempts to recover the waste, plant employees became intoxicated with alkyl lead, and employees in the surrounding area were exposed to airborne alkyl lead vapor.

Incidents like these led to the President's proposed Hazardous Waste Management Act.[188] Under this bill, hazardous wastes would be identified by the EPA Administrator and standards for treatment and disposal issued. Guidelines would be established for state agencies, which would have primary responsibility for regulation. For the most hazardous wastes, a permit system would be set up under direct Federal regulation. Federal authority would also be provided to ensure compliance with the standards if states failed to carry out the guidelines or if an imminent hazard arose. The Congress has yet to hold hearings on the President's proposal.

## Resource Recovery

Recycling activity in the past year has focused on developing municipal resource recovery systems and on testing new recovery technology. It is apparent from this work that a variety of technologies are available and that a continued Federal role in funding full-scale demonstration projects would have limited value.

A recent study released by the Council on Environmental Quality, *Resource Recovery: The State of Technology*, concludes that technology is not a barrier to increased resource recovery from municipal wastes.[189] The major categories of resource recovery processes are: 1) energy recovery processes—recovering the energy content of mixed municipal wastes, in the form of steam, electricity, or fuel; heat recovery from incinerators is the most developed and widely practiced method for recovery of resources from mixed municipal wastes but is not the most attractive economically; 2) materials recovery processes—separating and recovering paper, metals, and glass from mixed municipal wastes; 3) pyrolysis processes—thermally decomposing the mixed municipal wastes in controlled amounts of oxygen to produce oil, gas, tar, acetone, and char; 4) compost processes—producing a humus material from the organic portion of mixed wastes; and 5) chemical conversion processes—chemically converting the waste into protein and other organic products.

The report's economic analyses indicate that several systems, primarily heat recovery, materials recovery, and pyrolysis, can compete economically with disposal by incineration and with long distance hauls to landfills. However, the report states that the economics of resource recovery systems depend highly on the markets for wastes, which are not yet fully developed. Hence these systems are not self-sustaining operations because they do not recover revenue sufficient to offset total costs.

Despite some economic disincentives, new resource recovery systems are being planned and instituted across the Nation.

In Baltimore a 1,000-ton-per-day resource recovery system is being constructed under an EPA demonstration project.[190] Solid waste will be converted into fuel gas by pyrolysis. The steam produced will be sold to the Baltimore Gas and Electric Co. Ferrous metal and glass will be recovered and sold.

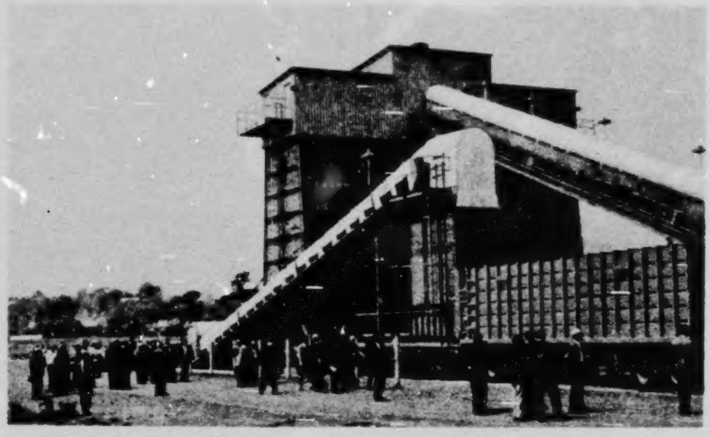
In San Diego, a 200-ton-per-day EPA-supported pyrolysis system should be operational by November 1974. The demonstration project will produce fuel oil and other byproducts. Over 1 barrel of fuel oil, 140 pounds of ferrous metals, and 120 pounds of glass will be generated from the average ton of refuse. The oil will be low sulfur,[191] consistent with air quality standards.

St. Louis is operating a facility that converts solid waste into fuel for a Union Electric power generating plant under an EPA grant. The plant can handle up to 30 percent of the city's trash load, and the converted solid waste replaces 10 percent of the coal normally burned by the powerplant.[192]

In New Orleans, the National Center for Resource Recovery (NCRR), a nonprofit, industry-supported organization, is helping to finance, organize, and design a unique resource recovery facility to be operated in conjunction with a sanitary landfill.[193] The system, which recovers metals and glass for reuse, will be financed entirely by the NCRR and Waste Management, Inc. The legality of the sole source procurement for the facility is now being contested in the courts.[194]

In Wilmington, Del., ground has been broken for a $13.7 million plant.[195] From 50 tons of refuse and 230 tons of sewage sludge per day, this privately operated plant, another EPA-supported demonstration project, will produce metals, glass, and paper.

One of the earliest and most publicized resource recovery systems is the Black-Clawson process in Franklin, Ohio. The plant has been producing paper fiber and ferrous materials from about 50 tons of solid waste per day. A glass recovery system producing color-sorted



The municipal solid waste recycling plant in St. Louis.

glass and aluminum began operating in May. EPA has contracted for a technical, environmental, and economic evaluation of the system.

Although the technology for resource recovery is available and the use of postconsumer wastes is increasing in absolute quantities, the percentage of recycled versus total materials used is still declining. For example, EPA estimates that waste paper consumption as a percent of total fiber consumption dropped from 23.1 percent in 1960 to 17.8 percent in 1969.[196] The basic reason for this decline is the competitive advantage generally enjoyed by virgin materials. Virgin materials tend to be cheaper, partly because of depletion allowances and other tax benefits and partly because most manufacturing facilities are located nearer the sources of virgin materials than the sources of recycled materials. For example, most paper mills are cited closer to forests than to major metropolitan areas. In some cases, virgin materials also have the advantages of higher quality and relative ease of extraction compared to recovery of recycled materials from mixed wastes.

Preliminary analyses developed for CEQ and reported by EPA indicate that use of recycled materials can reduce air emissions, waste generated, and energy consumed compared to use of virgin materials. Making 1,000 tons of steel reinforcing bars from scrap instead of from virgin ore takes 74 percent less energy and 51 percent less water, creates 86 percent less air pollution emissions, and generates 97 percent less mining wastes.[197]

## Solid Waste Management

A particularly significant development in solid waste management is the growing involvement of private industry. Approximately 10,000 U.S. firms currently operate 62,000 vehicles and employ over 100,000 people in solid waste management. In residential collection, they serve about 110 million residents located in about 35 million housing units (about one-half the U.S. population). Private contractors handle over 90 percent of commercial and industrial wastes and collect approximately 73 percent of the total solid waste tonnage in the Nation.[198] Often private firms have proved to be more efficient than units of government in managing solid wastes.

Better solid waste management techniques, often developed with technical assistance from EPA, have saved considerable sums of money. The city of Cleveland, by reducing crew size, creating more efficient operations, and changing from backyard to curbside collection, has reduced the annual solid waste budget by 43 percent, from $14.8 million to $8.5 million.[199]

River Rouge, Mich., changed storage containers, which helped to cut costs by 58 percent. Huntington Woods, Mich., changed its collection sequence and cut costs by 28 percent without sacrificing the quality of service. The Marine Corps Recruit Depot at Parris

Island, N.C., will reduce its annual expenditure by 25 percent when it completes changes in its collection and disposal techniques, including a shift to acceptable sanitary landfill.[200] These examples indicate the results that can be achieved through proven solid waste management tools.

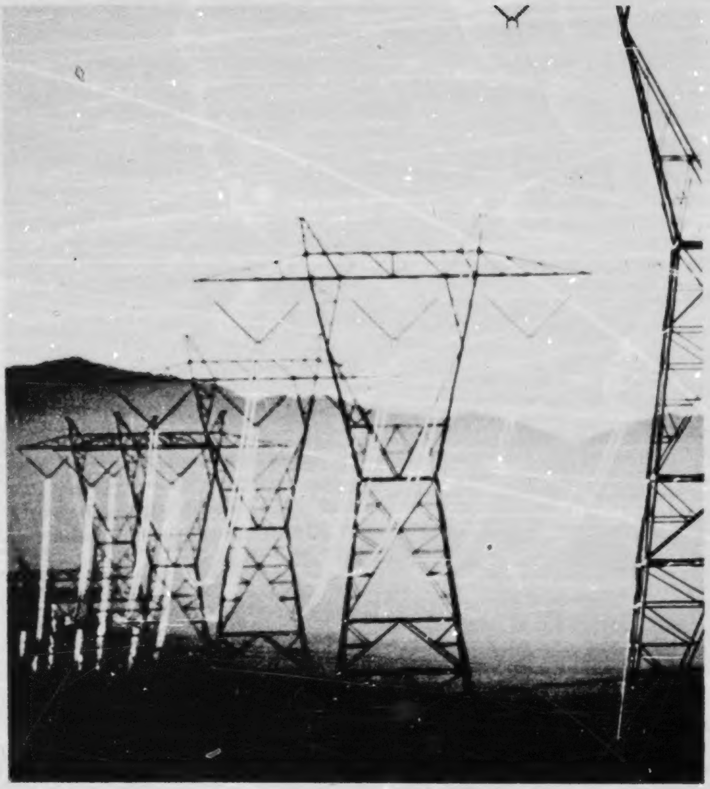
A number of states are examining possibilities for economy and environmental protection by managing solid wastes statewide or regionally. Connecticut completed a detailed State management plan and enacted legislation establishing a statewide disposal and resource recovery program.[201] The potential problems posed for New York City by a new law in New Jersey, authorizing State officials to regulate where garbage may be dumped,[202] illustrate the need for coordinated interstate waste management. New York City now disposes of about 10,000 tons of garbage weekly in New Jersey.[203]

Oregon is no longer the only State using the mandatory deposit approach to the litter problem caused by discarded beverage containers. A new Vermont law goes into effect in July 1973.[204] Similar bills are pending in a number of other states. The Oregon law,[205] which took effect last October, outlaws pull-tab openers on beverage cans and requires a 5-cent deposit on all beverage containers except standardized beer bottles, for which the deposit is 2 cents. A preliminary EPA survey shows that beverage container litter in Oregon has declined by 81 percent since the new law went into effect. The survey also shows stable beverage sales, a decrease in beverage prices, and 142 jobs lost in the can industry. Increased employment in bottling plants is expected. Cans now account for less than 1 percent of beer and soft drink sales.[206] EPA is conducting further studies in Oregon and expects to have more definitive results by the end of the year.

## Energy

Many issues of energy policy require trade-offs among environmental quality, economic factors, and national security. The importance of these interrelationships became more apparent during the past year as policies were developed to deal with energy shortages.

Environmental controls are among the significant factors responsible for current energy shortages and those predicted for the near future. But to single out any one factor is misleading. In fact, some of the claims concerning environmental impacts are inaccurate. This section looks at the relationships between recent energy supply problems and environmental factors as well as efforts to meet energy demands without sacrificing environmental quality.



High-tension power lines are becoming a dominant landscape feature.

## Energy Supply—the Past Year

The winter of 1972–73 witnessed an energy supply problem in several parts of the country. Natural gas was in short supply even in the producing states of the South.[207] In the early part of January, fuel oil and propane shortages forced the closing of 22 of Denver's 121 schools.[208] Factories and plants in many parts of the country were forced to shut down due to energy shortages.[209] Jet fuel was tight at New York's three major airports.[210] And demand for low sulfur residual oils, mainly for use in electric generating plants, exceeded supply. During the summer of 1972 there were sporadic shortages of electricity, and reserve generating capacity in some areas remains marginal.[211] This summer there have been shortages of gasoline in many areas of the country.

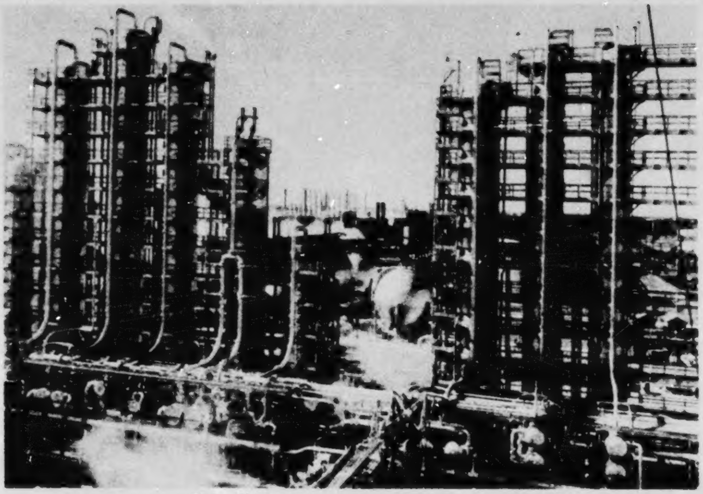
There is no single or simple explanation for these shortages. Many unrelated factors interacted to shape the situation. With respect to natural gas, controlled prices have artificially constrained the quantities supplied. Increased demand for gas was due to many factors, including its desirability as a clean fuel. But there are other reasons as well. In the Midwest, a late, wet harvest overlapped an unusually early cold spell to cause an unprecedented crop-drying requirement. The volume of natural gas demanded for crop drying exceeded supplies, and gas companies began cutting off their interruptible industrial customers. Based on reports filed with the FPC in February, 13 of the Nation's largest interstate pipelines had, or anticipated, curtailed deliveries this past winter.[212] The industries affected were forced to switch to other energy sources—mostly heating oil and propane.

A cold winter in the Midwest further intensified demand for home heating oil, which was already in short supply for a number of reasons. First, the price controls established in August 1971, when heating oil prices were at their seasonal low, left refiners with little incentive to produce extra quantities. Air quality standards also played a role. Faced with the need for controlling sulfur oxides emissions, electric utilities needed low sulfur residual oil for their generating plants. Because low sulfur residual oil was not available in sufficient quantities, additional volumes were produced by mixing high sulfur residual oil with low sulfur home heating oil. This reduced the sulfur content of the fuel but also increased the demand for home heating oil during what had traditionally been the off-season. As a result, refiners were unable to build normal inventories prior to the onset of the winter heating season. Heating oil production was increased, but at the sacrifice of diesel and jet fuel and gasoline.

This year's energy shortages resulted in large measure from insufficient oil refining capacity. A major reason for the oil industry's unwillingness to commit large sums to new refinery construction was uncertainty about Government policies, such as oil import policies and reducing lead content in gasoline. Now, with the termination of oil import quotas, oil companies have moved to expand refinery capacity. No fewer than five major refinery projects were announced within 3 weeks after the President ended import quotas in his April 18 Energy Message. At least 13 more projects are now indicated to be "on the drafting boards." [213]

Demand for gasoline is increasing. People are driving more while getting lower gasoline mileage. Miles per gallon have declined in part because of vehicle emission controls, but gas mileage is influenced more by the weight of vehicles and also by accessories such as air conditioning and automatic transmissions.

Environmentalists have been blamed for preventing new refinery construction, particularly along the East Coast, where the capacity shortage is most acute. However, the importance of new plant construction is sometimes exaggerated. It is interesting to note that



Insufficient oil refinery capacity has contributed to recent energy shortages.

roughly a 50 percent expansion of refinery capacity is possible at existing sites. More important reasons for the lack of increased capacity in the refining industry include uncertainty in price and volume of foreign crude oil supplies, the failure of some oil companies to foresee the rise in domestic demand, and general credit and economic conditions.

Delays in powerplant construction, particularly nuclear plants, have also been caused by a wide variety of factors. Contrary to many public statements, court actions by environmentalists are not the major contributor. Information available to the Council indicates that delays are primarily caused by nonenvironmental factors such as strikes, defective equipment, and late deliveries of equipment. Data submitted to CEQ by the Atomic Energy Commission in March 1973 indicate that final environmental impact statements were available, on the average, 8.2 months prior to fuel loading. A plant must be ready for fuel loading prior to licensing. Therefore the AEC data confirm that the NEPA environmental review process is not the major factor controlling the start of a nuclear plant's operations.

## New Energy Initiatives and Environmental Safeguards

In order to help prevent future energy shortages, the President in his April Energy Message announced a multifaceted program designed both to develop new domestic energy supplies and to conserve energy use. The message contained measures to protect the environment while meeting energy needs.[214]

**Increased Supplies of Natural Gas**—Natural gas is our cleanest fossil fuel. It does not cause extensive environmental damage during extraction, it is not spilled into waterways during transport, and emissions to the air are minimal. But natural gas has become increasingly scarce because its price has been regulated at a level far below that dictated by demand.

The President's proposal for deregulation of natural gas, if enacted, will provide two major environmental benefits. Deregulation would encourage more exploration and production. Price increases would discourage marginal uses in powerplants and industrial boilers where other fuels could be used in conjunction with environmental controls. Natural gas would be available for space heating and other uses where no other short-term alternatives exist to meet air quality requirements.

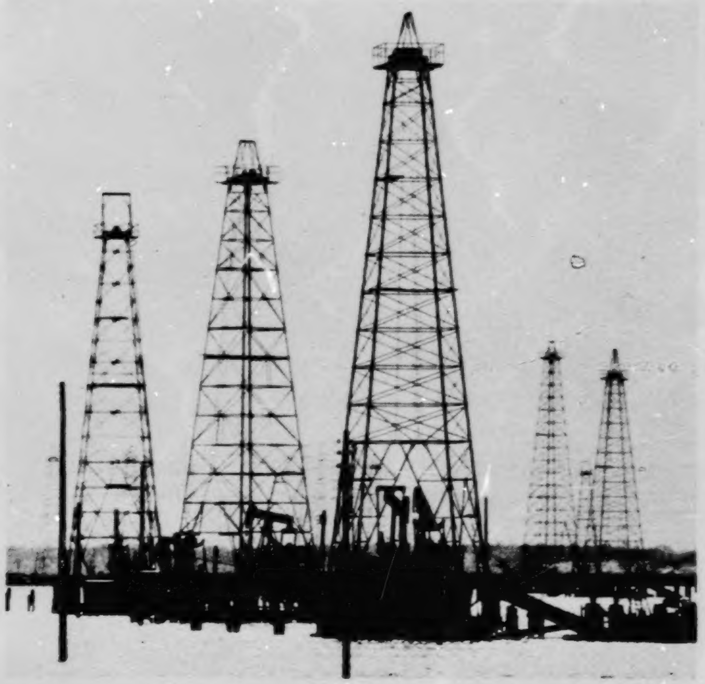
Although the costs of natural gas to consumers would increase, these costs would be small compared to the benefits. Much of the cost of natural gas is in transportation and distribution, and the costs of new, unregulated gas would be averaged with the current supplies of regulated gas in the prices paid by the consumer. But most important, without stimulating more exploration and production, the alternative is future shortages of this clean fuel.

**Use of Coal**—It will also be necessary, however, to use more coal, our most pollution-prone fuel. Although the production and consumption of coal can be environmentally harmful, it is by far the Nation's most abundant energy resource. At present rates of consumption, known reserves could supply the Nation's energy needs for at least 300 years. But expanding our use of coal means that we must control strip mining, effects of underground mining such as acid drainage, and emissions of sulfur oxides from coal combustion.

The President's proposed Mined Area Protection Act, submitted to the Congress earlier this year, would fix stringent standards for mining and reclamation and encourage reclamation of previously mined areas for both surface and underground operations. In the future, sulfur oxides emissions will be controllable by the use of stack gas cleaning technology that is emerging. But this technology is still several years away. Meanwhile, the Administrator of EPA has urged the states to delay implementation of secondary standards for $SO_X$. This action will ensure that limited supplies of clean fuels will be utilized in those areas which need them to meet health-related air pollution standards. It will also help to avert adverse effects on the U.S. balance of payments and on domestic coal industry employment that would be caused by importing enough low sulfur oil to meet all current air pollution standards.

**OCS Leasing**—Another Administration proposal would increase the acreage leased for oil and gas drilling on the outer continental shelf. Leasing would begin in new areas beyond the 200-meter isobath and beyond the Channel Islands in the Pacific if environmental impact analysis indicates that drilling can be done safely. The President directed the Council on Environmental Quality, working with EPA and Interior in consultation with the National Academy of Sciences and other Federal agencies, to study the environmental impacts of oil and gas development on the Atlantic outer continental shelf and in the Gulf of Alaska. The report and recommendations will be submitted within 1 year. Until this report is completed, no drilling will be permitted in either area.

**Oil Imports**—Even with energy conservation and development of domestic energy supplies, oil imports must increase. Last winter the Department of the Interior, at the direction of the President, relaxed restrictions on imports of home heating oil, and in March all limitations were removed on the number of oil import licenses which could be issued. Finally, in his Energy Message, the President announced the phaseout of the import quota system in favor of a license-fee



Rigs lie abandoned above a depleted oil field on the Texas coast.

system. All direct quota controls over the quantity of imported crude oil and refined products are being replaced with a license-fee system. Under the new system, holders of import licenses may import petroleum without charge up to their 1973 quota allocations; for imports in excess of the 1973 level, a fee must be paid by the importer. Over the next several years, license-fee exemptions will be phased out, and all petroleum imports will be subject to the license-fee system.

The resulting rise in oil imports means that more attention must be paid to ocean transportation. Several accidents have shown that oil spills are a major environmental problem. The United States has led in forging international agreements to reduce intentional and accidental spills from oil transport. But importing more oil will make the problem of oil spills in the ocean environment more acute over time.

The Council has conducted a study of the potential environmental impacts of domestic deepwater ports to handle supertankers. CEQ compared these impacts to those resulting from transshipment of oil in small vessels from Canadian or Caribbean superports into congested U.S. coastal ports. Domestic superports, properly designed and sited offshore, would result in considerably less spilled oil and less damage to the marine environment. Coupled with effective land use controls, development of U.S. deepwater ports offshore appears environmentally preferable to transshipment in small vessels. The President's proposal for licensing and environmental controls of offshore superports should help reduce potential pollution from the transportation of oil.

**Powerplant Siting**—The President's energy program also recognizes the need to create institutional mechanisms to protect the environment in the siting of electric powerplants. The President has proposed legislation to require utilities to undertake long-range planning and states to establish powerplant siting agencies. Utilities would be required to apply for approval of particular powerplant sites 3 to 5 years before construction. State and Federal approval would allow for consideration of the broadest range of environmental problems early enough to assure proper siting and controls.

**New Energy Sources**—Besides facilitating expansion of conventional power supplies, the Federal Government has intensified efforts to develop new energy sources. The Secretary of the Interior will file an environmental impact statement on a proposed prototype oil shale leasing program involving six tracts of public land in Colorado, Utah, and Wyoming. The Secretary will make an annual progress report on the oil shale development program which will be subject to public review. If the environmental risks for the prototypes are acceptable, further leasing will be considered.

In a parallel program, the Interior Department is preparing an environmental statement on a proposed leasing program under the

Geothermal Steam Act of 1970. Development of geothermal energy resources on public lands, under conditions of sound resource management and with the necessary environmental safeguards, could be a significant future source of clean energy.

In addition, the Federal Government has increased its research and development funds for several new energy sources, including coal gasification and liquefaction, solar energy, and nuclear fusion. The liquid metal fast breeder reactor program continues under high priority toward the goal of commercial demonstration by 1980.

**Energy Conservation**—Besides initiatives to increase supplies of clean energy, the President's Energy Message set forth a program of energy conservation. Adoption of a new national energy conservation ethic, with Federal leadership, is urged. More efficient use of energy benefits the environment and the consumer.

The Department of Commerce, CEQ, and EPA are initiating voluntary programs in which major home appliances, autos, and auto accessories sold by participating manufacturers will be rated for energy efficiency and ranked relative to one another. The ranking will be displayed prominently for the consumer. Without useful information on energy efficiency, consumers cannot make informed decisions when purchasing items.

In the recent revision of guidelines for preparation of environmental impact statements, CEQ requires that energy consumption be explicitly considered by Federal agencies. Federal agencies will adopt conservation guidelines in procurement and other decisions. An Office of Energy Conservation has been created by Presidential directive within the Department of the Interior. It will coordinate Federal energy conservation programs, conduct research on issues related to energy conservation, and educate the public on energy efficiency and costs.

Several Federal agencies are deeply involved in the promotion of energy conservation. The General Services Administration, with responsibility for design, construction, and operation of Federal buildings, is incorporating conservation principles directly into its planning framework and is constructing a Federal office building in Manchester, N.H., to demonstrate energy conservation. The Department of Housing and Urban Development has taken steps which will lead to better energy use in residential construction. Its Federal Housing Administration has upgraded insulation requirements for single- and multi-family structures financed under its guarantee. HUD is experimenting with new concepts in residential energy systems in its research and demonstration program.

The National Bureau of Standards, Department of Commerce, is furthering energy efficiency through applied engineering. A full-size house has been erected within the NBS environmental laboratories in Gaithersburg, Md., and engineers are measuring energy use under carefully controlled conditions. When the evaluation is complete, analytical techniques will be available to predict energy consumption in new structures.

In the transportation sector, both EPA and the Department of Defense are evaluating more efficient automobile engines. EPA has developed and published the first comprehensive set of auto gasoline consumption figures for a standard urban driving cycle.

**June Energy Statement**—In June the President issued an energy statement, expanding on his formal Energy Message of two months earlier and responding to national concern over the possibility of gasoline shortages. The statement announced immediate actions by the Federal Government to cut its energy use by 7 percent over the next 12 months and suggested voluntary actions by the private sector, such as reducing the speed of automobiles and commercial aircraft and setting air conditioners at higher temperatures, to achieve comparable reductions. Longer-term energy conservation opportunities were identified for study, including incentives to stimulate production of more efficient automobiles, energy-efficient recycling of waste materials, and use of energy conservation techniques in construction and operation of residential and commercial buildings.

The June statement also announced major reorganizations of Federal agencies dealing with energy. The President established a new Energy Policy Office within the Executive Office of the President, to be responsible for the formulation and coordination of energy policies at the Presidential level. The President also proposed to the Congress that a new Department of Energy and Natural Resources (DENR) be created. The new department would retain all of the present activities of the Department of the Interior, except the Office of Coal Research and certain other energy research and development programs. DENR would also include the Forest Service and some water resources activities of the Soil Conservation Service which are now in the Department of Agriculture; the planning and funding of the civil functions of the Army Corps of Engineers; the National Oceanic and Atmospheric Administration of the Department of Commerce; the uranium and thorium assessment functions of the Atomic Energy Commission; the functions of the interagency Water Resources Council; and gas pipeline safety functions of the Department of Transportation.

The President also proposed a new independent agency which would bring together and direct research and development programs on all forms of energy. The proposed Energy Research and Development Administration (ERDA) would include research and development programs in atomic energy from the Atomic Energy Commission and in fossil fuels from the Department of the Interior.

A major new energy research and development program was announced which would devote $10 billion to energy R&D over the next 5 years beginning in fiscal 1975. High-priority projects, particularly on coal, would receive an extra $100 million in fiscal 1974.

Events of the past year have given ample warning that the era of cheap and plentiful energy is at an end. The years ahead will see much greater national emphasis on the development of new energy sources and on more efficient utilization of traditional sources. The Federal response to the energy challenge has recognized the need to protect the environment. The new needs for energy will pose new problems for the environment, but the problems can be resolved. The long-term program to close the energy gap includes specific provisions to encourage energy conservation and ensure that energy will be supplied in ways which are environmentally sound.

## Land Use

In the year and one-half since the Council published its contract study, *The Quiet Revolution in Land Use Control,*[215] the Nation has seen rapid change in public attitudes and government response to the problems of land use. Some initiatives, particularly those related to reform of the property tax, were defeated at the polls or in state legislatures. But other land use proposals were enacted into law and existing laws were strengthened. A number of communities adopted or are considering strict limits on further growth and land development. The new land use control laws discussed in our past two Annual Reports—in Delaware, Florida, Maine, New York, and Vermont—are being actively implemented. Despite some legislative failures and continuing debate, land use reform is moving ahead and a new land use ethic is emerging.

### Proposed Federal Legislation

In its second session, the 92d Congress enacted the Coastal Zone Management Act of 1972. This Act encourages coastal states to regulate coastal land and water uses by authorizing grants to states and requiring that Federal actions in coastal areas be consistent with approved state programs.[216] Proposed Federal land use legislation, which would encourage states to protect critical areas and control large-scale development and growth, is still before the Congress. Passed by the Senate during the last session of the 92d Congress, the legislation was resubmitted this year by the President. He reiterated his strong recommendation for sanctions—loss of Federal highway, airport, and recreation funds—against states failing to develop acceptable land use control programs.[217]

The Administration also resubmitted to the Congress other land use legislation, including proposals to establish a management policy and authority for the 450 million acres of Federal "public domain" land, to require state regulation of powerplant siting, and to establish environmental controls on surface and underground mining, including stringent performance standards for reclamation. The President also resubmitted the Environmental Protection Tax Act. By reforming the tax code, it would discourage development of coastal wetlands, encourage the rehabilitation of historic buildings and eliminate current incentives for demolishing old buildings, and encourage charitable donation of land for conservation purposes.[218]

This year's floods have underlined another land use problem requiring strong Federal action—unwise development in flood plains. Proper controls on such development can save lives and property and preserve open space. The National Flood Insurance Act of 1968 makes federally subsidized flood insurance available only in communities or areas that restrict future development of flood-prone lands.[219] The Administration recently proposed amendments that would prohibit Federal Housing Administration and other federally insured loans for construction in flood-prone areas until the community joins the Federal flood insurance program. The bill would also prohibit federally insured lenders, such as banks and savings and loan associations, from insuring projects within a flood-prone area not covered by local zoning and the Federal flood insurance program.[220]

## State and Local Action

As much of the proposed Federal legislation specifies, the primary responsibility for land use reform lies at the state and local level, where the basic Constitutional authority exists to regulate land use and where the major legislative debates are proceeding. These debates underline a growing public concern about the current structure of laws and institutions to control development. In some sections of the country there is a mood of antigrowth, an inclination to shut the door on further community expansion or, at a minimum, to control the rate and location of new development. In other areas, public concern has been aroused to protect vital natural areas, such as wetlands and beaches, scenic mountain areas, and disappearing farmland. And in still other areas, broader land use laws are being fashioned to create a more rational process for making conservation and development decisions that affect the region or state.

**Comprehensive State Land Use Laws**—Florida has enacted a comprehensive land use law to control development and protect critical areas.[221] This law was discussed in last year's Annual Report. The State has now proposed regulations to implement its Environmental Land and Water Management Act which, if approved by the legislature, will identify the type and scope of critical areas and developments subject to State control.

This past spring, Oregon enacted broad land use legislation empowering the State government to control major developments within the State.[222] The act establishes a Department of Land Conservation and Development. A commission within the Department is to develop statewide planning goals to govern the preparation of comprehensive plans by all local governments. The commission will review permit applications for developments of "Statewide significance" and will recommend to the legislature the protection of certain critical areas of environmental concern. Developments of "Statewide significance" are defined as public transportation facilities, sewage, water supply and solid waste facilities, energy facilities, and public schools.

In establishing statewide planning goals and guidelines, the State commission is to give priority to the protection of critical areas such as flood plains and shorelands, the control of development around highway interchanges, and the protection of prime agricultural land. Thereafter, all zoning and subdivision ordinances and comprehensive plans of local government and other State agencies must conform to the commission's goals and guidelines.

The new law remains to be implemented, but it is evident that Oregon, which has been most vocal in its concerns about the hazards of excessive growth, is an important State to watch.

In at least one State—Maryland—a major controversy erupted over attempts to pass State land use legislation to protect critical areas. Uniformly opposed by the counties and many other local governments, the proposal was defeated in the last session of the legislature. However, the Governor plans to introduce similar legislation again in the next session and in the meantime will make full use of existing State land use authorities.

**Protection of Coastal Zones and Other Critical Areas**—Unlike Florida, whose comprehensive land use legislation covers both inland and coastal areas, California, New Jersey, and several other states acted to protect the coastal zone as a particularly critical area.

Efforts to secure legislative action on coastal zone legislation in California were unsuccessful over a number of years. After a major public campaign, the issue was finally placed as an initiative on the 1972 ballot; it passed by over 55 percent.[223] As a consequence, for virtually all development now taking place between the 3-mile seaward limit and 1,000 yards inland of mean high tide, a permit must be obtained from one of the State regional commissions established by the new law. Members have been named to the commissions, and efforts are underway to identify the boundaries and establish the procedures for carrying out the interim permit control program. The interim procedures will terminate in 1975, when a master plan for coastal development is to be presented for legislative approval by the State commission.

A legislative initiative in New Jersey for coastal zone regulation first failed and then was revived this year. Although the State has

California recently enacted its Coastal Zone Conservation Act to regulate land use along the ocean.

authority to regulate development in its coastal wetlands,[224] major development pressures along a wide area of the coast indicated the need for broader State controls than those applicable to wetlands alone. Proposed legislation supported by the Governor would have provided State veto power over any construction or expansion of "major facilities," residential or industrial, within the State's southern coastal zone, an area covering nearly one-seventh of that small but heavily urbanized State. Although passed by the New Jersey Assembly, the bill was defeated in the Senate after extensive opposition by the oil industry, labor, and local government interests. The Senate later reversed itself, approving in a special session a strong compromise bill that was recently approved by the Assembly.[225]

Across the Bay from New Jersey, local governments in Delaware began to react to the 1971 Coastal Zone Act,[226] which bans all heavy industry within 2 miles of the shoreline. New Castle County refused to amend its zoning code to conform to the State Coastal Zone Act. Whether this betokens wider local resistance to the Act remains to be seen.

While several other States consider the need for broad coastal zone legislation, virtually all of the coastal and Great Lakes states have enacted or are considering specific laws to protect their wetlands or shorelines.[227] In November 1972, voters in Washington approved an initiative referendum that provides controls over virtually all shorelines and adjacent areas 200 yards inland. "Shorelines of Statewide significance" are subject to special protection, but the basic strategy of the Shoreline Management Act is local regulation under State guidelines.[228]

Mt. Marcy, in the Adirondacks. New York recently adopted a State plan for this region, which is nearly as large as Vermont.

In New York, the legislature recently passed a coastal wetlands law which requires a State permit for any alteration of coastal marshes.[229] In May 1973, the legislature approved a land use plan, developed pursuant to a 1971 law,[230] to control development of the 3.7 million acres of private lands within the State's 6-million-acre Adirondack Park.[231] The plan bars major second-home developments, discourages uniform lot sizes, and promotes cluster development. For 53 percent of the private lands, development is limited to an average of no more than one building for every 8.5 acres. In April, the Governor had vetoed a bill that would have delayed legislative consideration of the plan for 1 year, stating that irreversible damage could be done to the park in the interim because of strong development pressures.

Many states are regulating development of wetlands—areas of critical environmental concern.

The massive floods along the Susquehanna last year and in the Mississippi valley this year point up the costs as well as personal hazards of uncontrolled development in flood plains. There is increasing recognition that flood damage must be alleviated not just by construction of dams and levees to lessen the damage but also by rational control over development in flood plains to prevent hazards. Last year the New Jersey Legislature took such preventive action by passing legislation which subjects all "floodways" within the State to direct State regulation.[232] It calls for the State to establish guidelines for local regulation in the broader "flood hazard" areas. The State is now in the process of delineating the boundaries of its floodways and flood hazard areas.

HUD reports that more than 2,200 U.S. communities have agreed to adopt controls on flood plain development under the Federal flood insurance program referred to earlier in this section. As of May, more than 230,000 flood insurance policies are in effect, with a total value of about $4 billion.

**The Recreational Land Sales Boom** Few Americans have been aware until recently of the massive recreational land sales boom underway in many parts of the country. From the Poconos of Pennsylvania and the Massanutten Mountains of Virginia to the rolling ranch land of southern Arizona, hundreds of thousands of acres of hitherto rural, scenic countryside are being cut up into suburban-like subdivisions. The scale and speed of recreational land sales have overwhelmed many local governments and, unless adequate controls are enacted, threaten to destroy the values that attract people in the first place. Because of the importance of this issue, the Council recently initiated a major study of recreational land sales and second homes. The study will include an assessment of the market forces, economics, environmental impacts, and institutional responses to this issue.

The first major public reaction to the recreational land boom occurred in Vermont. The International Paper Company's proposed 20,000-acre second home development in the southern part of the State set off a public outcry that ultimately resulted in the comprehensive land use law of 1970.[233] But few other states have moved so aggressively in response to recreational land sales pressures. Both California and New York now have statutes requiring full disclosure by developers of second home lots.[234] Efforts to enact such legislation in Pennsylvania have been unsuccessful. Implementation of the Michigan Land Sales Act [235] has been somewhat softened as pressures mount to delay the effective date of the Act.

More than 5,000 filings of developments designed to be sold or leased in interstate commerce had been registered with HUD's Office of Interstate Land Sales Registration by May. Under the Interstate Land Sales Full Disclosures Act, the developer of a registered subdivision must give the potential buyer an approved property report—

designed to provide the buyer with important information on the developer, development, and purchaser rights and obligations—prior to signing any sales agreement.[236] The Federal statute, limited to disclosure of information rather than enforcement of standards, seeks to increase consumer awareness and protection. More than 200 developments have been suspended from future sales for violation of Federal law or regulation, and a number of indictments of developers and salesmen have been secured.

**Limits on Growth**—While most significant land use reform has been at the state level, local communities are taking the lead in questioning how much growth is too much. Characterized as the "new mood" by the Task Force Report on *The Use of Land: A Citizens' Policy Guide to Urban Growth*,[237] public attitudes on development are showing a remarkable shift away from the historical American boosterism and toward a skepticism about the costs and benefits of unlimited growth. Local sewer moratoriums, bans on building permits, and attempts to limit population are cropping up throughout the country.

From the San Francisco Bay area and Boulder east to Fairfax and Fauquier Counties in Virginia and Ramapo, N.Y., and south to several cities in Florida, citizens and local officials are seriously pondering the mixed blessings of unlimited population growth and land development. In several cases, action has been taken to limit such growth. The primary motivations for controls appear to be a desire to preserve environmental amenities and avoid unwanted additional financial burdens on the tax base.

Voters in Boulder in 1971 narrowly defeated a charter amendment that would have set a maximum limit on the city's population. However, they did approve a resolution directing the city to take all necessary steps to hold growth in Boulder Valley to a rate substantially below that experienced in the 1960's. The city council was directed to conduct a study aimed at recommending an optimum population. With a grant from the Department of Housing and Urban Development, Boulder's study will be complete late this year. Meanwhile, the council has initiated a number of measures to slow the rate of growth.[238]

In Florida, Boca Raton citizens approved a 1972 referendum limiting the number of housing units within the city limits to 40,000. This would restrict to about 105,000 a population which, unrestricted, had been projected to exceed 200,000.[239] The population now totals about 35,000 persons in some 14,000 dwelling units.

To the south, along Florida's booming east coast, Hollywood has enacted an ordinance limiting the number of housing units per acre.[240] Nearby Hallandale, which has imposed a building moratorium, is considering an ordinance that would require developers to perform comprehensive impact analyses on certain types of proposed developments.[241] The Hollywood ordinance is being challenged in State court by a major land development firm with plans that would be severely curtailed by the ordinance. The Boca Raton law has been challenged in Federal court by a major developer. The legal challenges include the "taking" issue of Constitutional law, discussed in Chapter 4, Law and Land Use Regulation.

In Dade County and Miami, where a boom in population and development since World War II has been dizzying, selective building moratoriums have brought some control to growth.[242] Palm Beach and Martin Counties on the Atlantic, Collier County on the Gulf, and communities in the St. Petersburg-Tampa area have recently adopted building moratoriums or density limits.[243]

In suburban Fairfax County, Va., just across the Potomac from the Nation's capital, the Board of Supervisors has reached tentative agreement on guidelines prohibiting residential development unless public facilities—such as schools, sewage systems, and public transportation—are adequate to serve the new residents. The guidelines would require development to be compatible with environmental standards and resource limitations.[244] The Board is also considering a land bank fund, which could be the first of its kind in the Nation. The county would buy up critical land, such as that adjacent to new rapid transit stations, for eventual resale to developers at such times and under such conditions as the Board determines.

Just beyond Fairfax County and about 40 miles outside Washington, D.C., is Fauquier County, a predominantly rural county with large estates and extensive pasture land. Many of its 26,000 residents, sparsely scattered over 660 square miles, originally settled there to avoid crowded hustle and bustle. With rising housing costs in Fairfax and other nearby counties and with highway improvements, many Fauquier residents fear that what they settled there to escape will soon engulf them if they fail to act. At the initiative of a local citizen's group, the Fauquier supervisors in early 1973 enacted a 6-month moratorium on subdivision approvals in order to establish a capital improvement program and amend subdivision and zoning laws. The supervisors want to review future applications in light of the improvement program, the tax burden, and environmental factors.[245]

On the other side of the Nation's capital, the supervisors of Montgomery County, Md., have adopted an ordinance similar to the guidelines being considered by Fairfax County. It requires adequate public facilities as a precondition for development. Severe overloading of the regional sewage treatment facility and resultant water quality problems in the Potomac River have led Montgomery County to impose a moratorium on sewer hookups to stop new residential construction. A recent report, however, suggests that some exempted permits have been granted, causing pollution to increase.[246] Overtaxed sewer and water facilities also prompted Narragansett, R.I., to declare a moratorium against further multifamily residential development.[247] Thus, as noted in the section on air quality, pollution control requirements are beginning to dictate land use controls.

In the San Francisco Bay area, the Association of Bay Area Governments (ABAG) is conducting a study of the ramifications of proposed guidelines limiting growth in that multicounty region to 5.5 million by 1980.[248] Growth control measures adopted by the cities of Livermore and Pleasanton have been declared unconstitutional by a State trial court.[249] A study conducted for Palo Alto showed that the public service costs of developing the foothills area comprising half of the city's acreage would far exceed expected tax revenues from such development. Accordingly, the city has begun to zone the foothills land for open space—for farming, golf courses, large lot residences, and research facilities.[250]

Only a few states have begun to deal with growth control, among them Oregon and Vermont. More recently, the New York State Department of Environmental Conservation took a step in this direction by issuing an "Environmental Plan" to guide future development in the State without endangering air, water, or land resources. After hearings and approval by the Governor, the Plan will serve as a State policy guide for development affecting the environment.[251]

Some growth control sentiment undoubtedly reflects a mood of exclusivity among wealthy residents of areas that are beyond the reach of those with more modest incomes. Growth controls so established may unfairly restrict balanced development. But many citizens are beginning to question sincerely and seriously both the economic and environmental burdens of unrestrained growth. Reconciling the sometimes conflicting goals of regional development and environmental protection is a major challenge confronting state legislatures and local officials. Land use reform is clearly in transition.

The significant state land use actions of the past year must be viewed in the perspective of the numerous programs established in prior years—ranging from the Maryland Wetlands Act to the Maine Site Selection Act and the Massachusetts Zoning Appeals Law. There is a momentum for reform taking different shapes in different states. California's new Coastal Zone Conservation Act has stretched the reform movement beyond the Eastern United States, where it has been centered. The major remaining need is for strong Federal legislation that will stimulate all states to act, most importantly on land use controls and on the issues of protecting mined areas and controlling powerplant siting.

## Protecting Our Natural Heritage

With vast land resources and an historical settlement pattern that has left many scenic areas relatively free from development pressures, the United States has been a world leader in protecting important natural values. Our system of national parks, discussed in last year's Annual Report, is perhaps the best example. The United States has worked to preserve wildlife as well, particularly species threatened with extinction from man's activities.

Nevertheless, more needs to be done. Existing protection for endangered species is inadequate. Predator controls must be reformed to avoid harm to nontarget species and to end overkill of predators. Important potential wilderness areas in the East, where most of our people live, must be evaluated and preserved. Initiatives for protection of our natural heritage are reflected in pending legislation and in new international agreements now awaiting ratification by the United States and other nations. This section reviews the status of existing programs and the significance of pending proposals to protect our natural heritage.

## Protection of Wildlife

Many environmental laws help to protect wildlife. Federal and state laws have established numerous wildlife refuges.[252] The National Environmental Policy Act,[253] the Fish and Wildlife Coordination Act,[254] and comparable state laws [255] require advance consideration of the impact of government or government-sanctioned action on fish and wildlife. Environmental laws to protect man also benefit wildlife. For example, the Federal Clean Air Act will protect animals and wildlife,[256] and a major objective of the Federal Water Pollution Control Act is to protect fish and other wildlife from the effects of waterborne wastes.[257] In recent years, increasing attention has been devoted to protecting species threatened with extinction because of man's activities, particularly sport hunting, commercial hunting, and trading.

**Endangered Species**—The Endangered Species Preservation Act of 1966, as amended in 1969,[258] authorizes the Secretary of the Interior to compile a list of fish and wildlife threatened with extinction and to prohibit their importation. It also makes it a Federal crime to buy or sell animals taken in violation of any state or foreign law. The Secretary is directed to encourage conservation and growth of native endangered species.

Legislation to remedy serious defects in the current law was proposed by the President in 1972 and resubmitted with strengthening modifications this year.[259] The proposed new law would make a Federal crime the taking of federally designated endangered species by any person under U.S. jurisdiction. In addition, Federal land leases or use permits and Federal hunting and fishing permits could be suspended for violations. The Act would protect species not immediately threatened with extinction but which can be expected to be threatened in the future if protective measures are not taken promptly. The bill would also allow listing of a species that is not

The American Bald Eagle is an endangered species.

threatened worldwide but is threatened in a significant portion of its range.

Current law does not protect endangered plant species.[260] However, the Smithsonian Institution is planning a study in cooperation with other Federal agencies of the need and means for such protection.[261]

In March, an important step was taken toward international protection of endangered species by the development of the Convention on International Trade in Endangered Wild Flora and Fauna.[262] The Convention, now awaiting ratification, is discussed in Chapter 7, International Action to Protect the Environment. Legislation is now being prepared to make U.S. laws conform fully with the Convention. Underscoring the magnitude of the endangered species problem, the largest U.S. enforcement action under the existing law occurred while the delegates from approximately 90 nations were in Washington to complete the Convention.

**Marine Mammals**—The Marine Mammal Protection Act of 1972[263] gives special domestic protection to marine mammals, including whales. The Act prohibits the taking or importation of such mammals and their products by U.S. citizens. The Secretary of Commerce or Interior, depending on the species, can waive this prohibition only if he receives scientific evidence that the waiver, and the regulations on takings that he must develop after a formal hearing, will not be to the disadvantage of the species or stock to be taken. The emphasis of the Act is on the interests of the species, reflecting a new philosophy in wildlife protection which contrasts with the traditional concern for an optimum harvestable commercial yield.

**Predator Control**—The control of livestock predators, such as the coyotes commonly found in the West, is an important concern in livestock management. However, the large-scale use of poisons to control predators threatens beneficial animals and entire ecosystems.

A 1971 report to the Council and the Department of the Interior indicated that necessary predator control can be achieved without poison.[264] On the basis of the report, the President issued an Executive order banning the use of poisons against predators on Federal lands.[265] EPA subsequently terminated registration for public and private use of three common poisons to control predators—1080, cyanide, and strychnine.[266] Interior has indicated that experience on Federal lands since the Executive order demonstrates that predator control can be effective without the use of poisons.[267]

Current Federal authority for predator control, based on a 1931 law,[268] reflects an outmoded philosophy that the Federal Government should participate directly in controlling predators. Federal law also contains no incentives to encourage states to develop environmentally acceptable control programs. Accordingly, the Administration has resubmitted to the Congress a bill to encourage state administration of predator control efforts.[269] In order to encourage state programs consistent with the Federal policy on poisons, the bill authorizes financial aid to states meeting Federal standards. These standards would prohibit the use of chemical toxicants against predators. The bill would also authorize expanded Federal research on improved methods for predator control. The Administration's proposal would further the new approach which seeks to minimize predator damage while protecting the environment.

## Protecting Wilderness and Other Important Lands

**Wilderness Areas**—By enactment of the Wilderness Act in 1964,[270] the Congress established a National Wilderness Preservation System of federally owned lands to be preserved in their natural condition. Protected from alteration by man, national wilderness areas exist so that present and future generations, as temporary visitors, may enjoy their solitude and natural beauty.

The 1964 Act designated as wilderness 54 areas covering about 9.1 million acres of land, most of which are in the West. The Act also established a procedure for designating additional areas. It requires that specific types of potential wilderness areas—primitive areas and roadless lands within parks and wildlife areas—be evaluated by the

More Eastern wilderness areas, like Linville Gorge in North Carolina, would be designated under legislation proposed by the President.

Departments of Agriculture and Interior and that recommendations concerning wilderness designation be made by the President. An additional 37 areas have been added to the wilderness system since 1964 under this procedure, bringing the total acreage in the system to over 11 million.[271]

This year could be the most active since 1964 for wilderness areas. A backlog of 47 areas proposed or endorsed by the Administration is pending before the Congress, and roughly an equivalent number have been proposed by individual Congressmen as a result of constituents' initiatives.[272]

In recent years, the President and Congressional leaders have called for special efforts to identify and designate new wilderness areas in the East so that wilderness accessible to the Nation's large eastern population will be preserved. The Administration has proposed the Eastern Wilderness Amendments of 1973.[273] This bill would permit designation of many new wilderness areas located in National Forests east of the 100th meridian. The Forest Service of the Department of Agriculture has already identified 53 areas in the East which merit study for preservation as wilderness.

These areas may not qualify under the current definition of wilderness as "land retaining its primeval character and influence without permanent improvements or human habitation—and which generally appears to have been affected primarily by nature, with the imprint of man's work substantially unnoticeable." [274] Hence the proposed legislation would authorize wilderness designations in eastern national forest lands "where man and his own works have once significantly affected the landscape" but where "the imprint of man's work is substantially erased" and "which has generally reverted to a natural appearance." [275]

The legislation would prohibit mining, mineral leasing, and grazing in the new eastern wilderness areas, restrictions that do not apply to wilderness areas under current law. Pending Congressional action, the Forest Service will protect identified potential wilderness areas from timbering, mining, and other development under other legal authorities.

Another bill, initiated within the Congress,[276] would designate 28 new wilderness areas in National Forests in the East, Midwest, and South. This bill is based on the premise that areas in the East can be designated under current law.

Differences in interpretation of the current law should not obscure the widespread support for establishing Eastern wilderness areas. The public has an opportunity to play a significant role in wilderness designation by participating in agency hearings on study areas and by making its views known to elected officials.

**Wild and Scenic Rivers**—Four years after the Congress established the Wilderness Preservation System, it enacted legislation recognizing the importance of preserving in a natural condition scenic, free-flowing rivers. The 1968 Wild and Scenic Rivers Act [277] designated all or part of eight rivers and adjacent lands as the nucleus of the National Wild and Scenic Rivers System. Seven have not yet been fully acquired. Legislation proposed this year by the President would increase authorized funding from $17 million to $37.6 million in order to complete the purchase of these areas. The new legislation would also extend for another 5 years the current statutory moratorium on Federal Power Commission licenses and Federal agency assistance for dams and other water resource projects that might impair rivers being considered for inclusion in the Wild and Scenic Rivers System.[278]

In 1970, the President terminated the Cross-Florida Barge Canal because that project threatened to destroy the unique sce[illegible] beauty and wildlife habitat found along the Oklawaha River. He asked the Council on Environmental Quality and the Secretary of the Army to recommend measures to ensure future protection of the affected area. The Department of Agriculture now plans to purchase, for inclusion in the Ocala National Forest, the land formerly designated for the canal project. In addition, the two agencies recommended to the Congress that the Oklawaha River be designated for study as a possible wild and scenic river.[279]

As discussed in our last two Annual Reports, more than 20 states have some form of wild rivers preservation system.[280] In December 1972, California adopted a new law, modeled substantially after the Federal law, establishing a state system and specifying five northern California rivers as the first components.[281]

Increasing numbers of citizens are seeking to enjoy the amenities of nature in wild areas. More people with more leisure time want to get away from it all in a variety of ways—an escape to natural surroundings is a major interest. Expansion of protected wild lands and rivers is an imperative for future generations.

**Areas of Special Concern**—Certain unique wild areas, ranging from the sloughs and tree islands of Florida's Big Cypress Swamp to the vast tundra of western Alaska, become areas of special concern to the Nation when man's development threatens harm. Sometimes development must be prohibited, sometimes strictly controlled. In any case, the environmental threats must be carefully assessed, competing developmental interests weighed, and protective measures imposed.

Two examples of Government response—the Trans-Alaska Pipeline and the Big Cypress Swamp—are discussed below. One involves the challenge of reconciling energy needs with environmental protection through Federal permit issuance, subject to both legislative and judicial constraints. The other involves a Government decision to purchase land in order to protect an area from development. A major example of private intitiative to preserve a special area—the Great Dismal Swamp—is also discussed.

**Alaska Pipeline**—Since 1970 a consortium of oil companies has sought Federal permission to build a pipeline across public lands in Alaska. It would carry oil discovered in 1968 from Prudhoe Bay on Alaska's North Slope some 789 miles to the port of Valdez on Alaska's southern Pacific coast. The oil would be shipped by ocean tanker to the West Coast.

In 1970, the Wilderness Society, the Environmental Defense Fund, and other environmental groups obtained a court injunction against issuance of a Federal permit for construction of the pipeline right-of-way, including a road.[282] The court accepted their contention that an environmental impact statement on the project was required by NEPA[283] before such preliminary work could be approved. The

Acquisition of Big Cypress Swamp is needed to protect Everglades National Park.

environmentalists were concerned that the hot pipeline could permanently damage the fragile tundra and would disrupt wildlife migration. They also recognized the dangers of oil spills—from the pipeline in case of earthquake and from the tankers in case of accident.

An impact statement was completed in 1972 and the Secretary of the Interior announced his decision to grant the right-of-way permit. However, a District Court order dissolving the 1970 injunction was reversed by a Federal Court of Appeals because of an issue previously obscured by the environmental question—the 1920 Mineral Leasing Act prohibition against granting rights-of-way exceeding the width of the pipe (4 feet in this case) and 25 feet on either side. The proposed permit would have allowed the substantial additional width requested by the consortium.[284]

By declining to review the Court of Appeals decision, the Supreme Court forced the controversial pipeline question on the Congress,[285] where legislation reflecting three main points of view was considered. One proposal was that the necessary right-of-way be authorized but that any environmental issues be resolved under existing NEPA requirements.[286] A second point of view was both to authorize the right-of-way and to foreclose any further environmental consideration under NEPA.[287] A third position favored a delay while the feasibility of an alternative pipeline route across Canada to the U.S. Midwest could be more carefully explored.[288]

In mid-July, a bill authorizing the necessary right-of-way was considered by the Senate. An amendment requiring exploration of the Canadian alternative was defeated, but a second amendment determining that the 1972 impact statement and other Federal actions satisfied the requirements of NEPA was passed. On July 17, shortly before this report went to press, the Senate passed the bill.

The Alaska pipeline case not only illustrates the role that courts play in defining and requiring compliance with environmental laws, but it illustrates the potential role of the legislative branch in major public policy controversies that prior laws have not explicitly addressed. Reliance by the Court of Appeals on the Mineral Leasing Act of 1920 [289] and refusal by the Supreme Court to review that decision set the stage for what environmental law commentators have called a "legislative remand." [290] Their decisions avoided settling the controversy by judicial determination resting, in fact or in appearance, on legal "technicalities"—an approach that might give rise to claims of "policymaking" by the judiciary. Instead, the decisions of the courts, although technically amounting to a straightforward interpretation of a law that the Congress enacted long ago, referred the final decision on the pipeline to the legislative branch.

**Big Cypress**—In marked contrast to the Alaska pipeline case, the Big Cypress question [291] does not require resolution of competing national interests in development and environmental protection. There is clearly a national interest in protecting Big Cypress, but the Government must act to prevent local developmental pressures, which can be satisfied elsewhere, from jeopardizing unique resources important to the Nation.

Everglades National Park, established in 1947, is the Nation's third largest park. Its ecosystem—the Nation's only significant subtropical marshland—depends on fresh water, and considerably more than one-half of the Park's 1,400,533 acres depends upon Big Cypress for its supply of fresh water.

The land in the Big Cypress-Everglades ecosystem has an almost imperceptible slope, which results in very slow drainage, extending the wet months well beyond the period of rainfall. A water level change of only a few inches can affect thousands of acres and seriously disrupt the food chain on which larger animals depend.

The Big Cypress watershed is a natural water storage area, supplementing the manmade storage areas that are required for south Florida's water supply. Big Cypress itself is also a valuable resource. It is a wilderness of sloughs, tree islands, and bay and cypress heads. Nearly all the wildlife species native to semitropical Florida are found within the watershed. Big Cypress provides important feeding, nesting, and wintering areas as well as a resting place for migrating birds. It contains important habitat for at least nine species of wildlife determined by the Secretary of the Interior to be threatened with extinction. To species that have wider ranges, Big Cypress, along with the adjacent Everglades National Park, serves as a stronghold or retreat. Large portions of Big Cypress have so far experienced little manmade disturbances.

To preserve Big Cypress from encroaching development pressures, the President has proposed the creation of the Big Cypress National Fresh Water Reserve. It would contain up to 52,000 acres of private land and approximately 48,000 acres of publicly owned land.[292]

The proposed legislation authorizes appropriations of up to $156 million for Federal land acquisition. The Governor of Florida has indicated that he will recommend commitment of $40 million in State funds to purchase environmentally sensitive areas in the proposed reserve in cooperation with the Federal program.[293]

**Great Dismal Swamp**—Straddling the Virginia-North Carolina border just below Chesapeake Bay is a unique area being preserved at private initiative. The Great Dismal Swamp,[294] rich in wildlife and historic lore, is the northernmost of the chain of swamps along the East Coast that ends with the Everglades-Big Cypress area. This gigantic, 100,000-acre peat bog, whose water is colored brownish-purple by peat stain and tannic acid from decaying trees, is owned by 11 private parties.

The major landowner, Union Camp Corporation, recently deeded 50,000 acres of the Swamp to the Nature Conservancy, a private, non-profit foundation dedicated to preserving environmentally critical areas.[295] The Conservancy, in turn, transferred the land to the Federal Government for official protection as a wildlife preserve. Legislation recently passed by the House would make it a National Wildlife Refuge, and the Interior Department is developing recommendations for the future.[296]

One of the earliest colonial settlers, apparently reflecting the general opinion of his contemporaries, viewed Dismal Swamp as a "vast body of dirt and nastiness." [297] George Washington, who once owned roughly the same area that Union Camp donated, considered it a "glorious paradise." After his plan to drain it for a corn plantation failed, farmers and loggers canalled and cleared the land for over 100 years, reducing the total original acreage of 250,000 to about 100,000. Environmental groups have worked for over 2 decades to preserve the area, which in modern times has been threatened with development proposals ranging from a jetport to a racetrack. Union Camp's action represented a major victory for conservationists.

**Parks**—As the chapter on National Parks indicated last year, a major issue facing both national and state park systems today is the relative weight to be given to recreational development—accommodations, roads, and related facilities—as opposed to preservation of relatively unaltered natural tranquility.[298] The challenge is to avoid making parks into imitations of urban civilization, with pollution, congestion, and other problems. Yet parks should not be so inaccessible that they become the preserve of a wilderness elite.

One way to alleviate some of the conflicting pressures on parks is to provide more of them near urban centers, where people can enjoy nature even on a short outing. Although such new parks will not eliminate traffic and demand for development in the more remote parks, they are vital in their own right. Urban parks provide the only nature-based recreational opportunity for many low-income citizens. Even affluent urban residents have limited time to travel to distant parks.

Much of the current Federal program for new parks is directed at urban areas. The President's proposals for the 23,000-acre Gateway National Recreation Area near New York City and for the 24,000-acre Golden Gate National Recreation Area near San Francisco were enacted into law in 1972.[299] Once necessary local approvals are obtained, these areas will make scenic natural amenities available to millions of people in two of the Nation's largest urban areas.

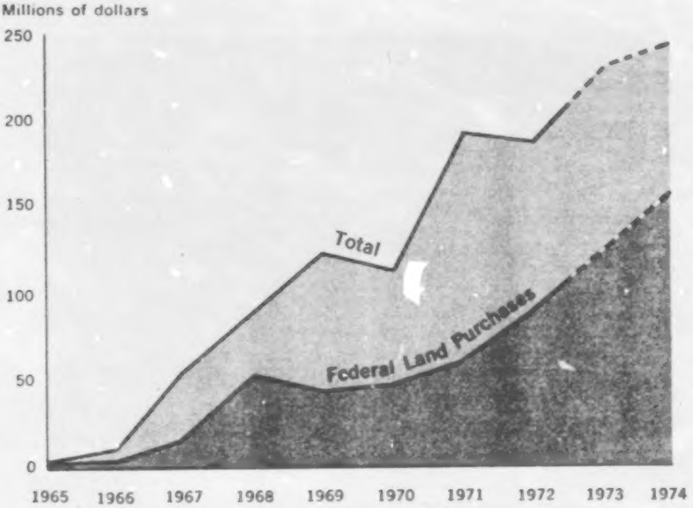
The Legacy of Parks program, initiated by the President in 1971, is continuing to make more open space and recreational land available to people near their homes. A major thrust of the program is to transfer underutilized Federal properties to state and local governments for parks. As of July, over 54,000 acres of Federal lands, with an estimated fair market value of more than $147 million, has been converted to parks in the 50 states, the District of Columbia, and Puerto Rico.[300]

Another initiative for more urban parks is the Administration's proposal to revise the statutory formula for allocating Federal Land and Water Conservation Fund grants to help states and localities acquire park and recreational lands.[301] The current formula channels a disproportionately small percentage of these funds to states with large urban populations. Figure 2 shows that despite a reduction in new fiscal year 1974 budget authority, there is a trend of increasing outlays from the Fund, both for grants to states and for direct Federal acquisition.

Programs to preserve our natural heritage are well established in our laws and institutions. As we noted in last year's Report, wilderness backpacking and similar activities are increasingly popular. This growing appreciation of natural amenities, a part of environmental awareness and concern, offers a base of public support for new and strengthened programs needed to keep abreast of rising expectations of the population.

**Figure 2**

**Land and Water Conservation Fund Outlays for Fiscal Years 1965–1972 and Estimated Fiscal Years 1973 and 1974**



Source: Office of Management and Budget, *Budget Highlights-Fiscal Year 1974* (Washington: 1973), p. 51

## NEPA Developments

The National Environmental Policy Act establishes environmental protection and restoration as a national policy and goal. It requires Federal agencies to interpret their traditional mandates in the light of these environmental objectives, and it establishes an action-forcing mechanism in section 102(2)(C) under which agencies must prepare and circulate for comment analyses of the environmental impacts of their actions.[302]

NEPA and its requirement that Federal agencies prepare detailed statements on "major Federal actions significantly affecting the quality of the human environment" impose broad demands upon the Federal establishment. Agency impact statements must fully disclose the impact of proposals and consider reasonable alternatives. And agencies must integrate NEPA's goals and objectives into traditional missions and patterns of decisionmaking.

### Revised CEQ Guidelines for Impact Statements

The most important procedural development under NEPA in the past year was CEQ's proposed revision of its guidelines to agencies for implementing section 102(2)(C) of the Act.[303] The Council's current guidelines, published in April 1971,[304] translate section 102's broad language into more concrete terms that afford a degree of certainty without relieving agencies of the many critical judgments that they must make. The revised version incorporates much of NEPA's legal evolution in the courts over the past 2 years and also reflects experience gained and lessons learned since 1971.

The proposed new guidelines emphasize that environmental considerations should be taken into account from the beginning of the decisionmaking process. Initial environmental studies, for example, should be undertaken concurrently with initial technical and economic studies. Too often agencies have written statements to justify decisions long since made. If they had begun their environmental assessments at the conception of their projects, the environmental information could have been integrated into, rather than tacked onto, the decisionmaking process, and in many cases delays could have been avoided. Under the proposed guidelines, draft impact statements are to be prepared and circulated at the earliest possible stage in the decisionmaking process.

This concern for early consideration of environmental factors complements a new emphasis in the proposed guidelines on substantive compliance with the policies set forth in sections 101 and 102(1) of NEPA. The new guidelines require agencies to evaluate the results of their environmental analyses, together with economic, technical, and other factors, and to use all practical means to minimize or avoid undesirable environmental consequences.[305]

The proposed guidelines encourage the use of program or generic impact statements to cover a number of related individual actions when comprehensive analysis is more useful and efficient than separate analyses of several related projects.[306] If sufficiently comprehensive and informative, such program statements eliminate or reduce the need for further individual project statements. Program statements cut redundancy and unnecessary paperwork and make the environmental analysis more meaningful. Of course, a separate statement would be required for a future action that has significant impacts not adequately covered in a program statement.

The revised guidelines explicitly require agencies to discuss the secondary environmental impacts of their actions, particularly on population concentration and growth.[307] Many Federal actions—such as highway and sewer construction and water resource development—attract people to previously unpopulated areas and indirectly cause pollution, congestion, and land development that probably would not have existed otherwise.

In the past, agencies have generally given only limited attention to secondary impacts. Agencies often neglected secondary effects analysis because they felt that they had neither responsibility for nor the power to control such effects. Moreover, it is often difficult to predict the extent of development caused by a project and the environmental effects stemming from this development.

In order to standardize the basic population and growth projections used by Federal agencies in secondary impacts analysis, the Council's guidelines suggest using OBERS projections developed for the Water Resources Council.[308] These projections are discussed in Chapter 6, Status and Trends. In addition, CEQ, in cooperation with HUD and EPA, has initiated a major study of the secondary effects of highways and sewers. A primary objective of this study is to develop better methods for Federal agencies to predict secondary environmental impacts.

The new guidelines specifically identify energy conservation as a factor for agencies to consider in determining the potential environmental significance of their actions.[309] It is especially important to evaluate energy use and possibilities for energy conservation in comparing alternatives to a proposed action. It is often possible to adopt an energy-conserving modification of a plan or design without sacrificing the project objective.

The status of public participation in the NEPA process is significantly augmented in the new guidelines. Agencies must publish revisions of their NEPA procedures in the *Federal Register* and invite public comment.[310] They must devise an "early warning" system for informing the public of decisions to prepare a draft environmental impact statement and encourage the public to provide information and views for use in preparing the statement.[311] Studies underlying the preparation of an environmental impact statement should be clearly identified in the statement, and agencies should indicate how these studies may be obtained.[312] Agencies are encouraged to facilitate public comment by automatically sending copies of draft statements to interested organizations and individuals.[313] Agencies are expected to send copies of final statements to all agencies and private organizations that made substantive comments on the draft statement and to individuals who requested a copy of the final when commenting on the draft.

Unfortunately, some agencies are still slow to implement fully the citizen involvement requirements of the NEPA process. Too often the burden rests with the public to find out what is going on rather than with the agency to keep the public informed. CEQ's revised guidelines seek to shift the burden, suggesting that agencies invite public involvement at the earliest possible stages of planning and decisionmaking.

Agencies are also encouraged to experiment with innovative methods of public participation beyond the standard format of public hearings. These may range from informal, unstructured contacts with community and environmental leaders to more formal panels of advisors on NEPA issues or clearinghouses for citizen inputs into the impact statement commenting process.

A Council memorandum of May 15, 1973, to Federal agencies supplements the proposed guidelines on public participation.[314] It addresses the tendency of some agencies to rely exclusively on the services of the National Technical Information Service of the Department of Commerce to meet public requests for copies of environmental impact statements. NTIS is frequently unable to provide copies to citizens in time to meet comment-filing deadlines, and NTIS prices for long statements are often very high. CEQ has suggested that agencies initially print enough copies of statements to cover anticipated demand from the public.

What we have seen so far is citizens and agencies facing off at opposite ends of the courtroom on controversial projects. In the future, there must be more citizen involvement—citizens and agencies working together around the conference table. A number of agency NEPA procedures encourage this kind of process. The development of constructive agency-citizen relationships may be the best hope for keeping Federal decisionmaking processes open and responsive to the public interest.

CEQ's proposed new guidelines were published in the *Federal Register* in May.[315] Comments were carefully evaluated. As this report went to press, the final guidelines were promulgated. They appear in Appendix D.

## Developments in the Courts

During the past year, the courts continued to review agency compliance with NEPA and to resolve important questions about the interpretation of the Act. Last year's Annual Report described the legal issues arising under the Act and the major court decisions that had resulted.[316] NEPA litigation in the past year continued at about the same pace as in the year before, with the total number of NEPA lawsuits now exceeding 400.

Most of the judicial developments under NEPA since the Council's last Report have further clarified procedural issues discussed there rather than unveiling new problems. However, in several major decisions the courts began to move into the question of agency responsibility to comply with NEPA's substantive requirements.

**Substantive Review under NEPA**—A few early court cases under NEPA suggest that the Act imposed mainly procedural duties—primarily the requirement to prepare an environmental impact statement. Indeed, most early NEPA cases involved only whether an impact statement was required—e.g., for actions initiated prior to enactment of the Act. These basic procedural questions have now largely been settled. As a result, litigation is turning to the content of statements and to the agency decisions made after statements are completed. A recent series of cases affirms the role of the courts in reviewing the substance of both the agency's impact statement and its proposed action.[317]

*Natural Resources Defense Council* v. *Grant*,[318] commonly called the *Chicod Creek* case, involves a watershed project by the Soil Conservation Service in North Carolina. Plaintiffs originally requested that an environmental impact statement be prepared, and the court agreed that the Act required it even though the project began prior to NEPA.[319] SCS prepared an environmental impact statement in response to the court order, but plaintiffs then argued that the court should continue its injunction against the project because the statement was inadequate. The court again agreed with the plaintiffs, noting that "NEPA requires more than full disclosure of environmental consequences and project alternatives. NEPA requires [their] full consideration in agency decisionmaking." [320]

The court held that the impact statement was inadequate because it omitted or inadequately described a number of important environmental effects of the project and failed to disclose fully or discuss adequately alternatives to the project. The court concluded that NEPA's full disclosure requirements had not been met. SCS is now preparing another environmental impact statement.

In February 1973, a Federal District Court in southern Texas issued a preliminary injunction concerning two interrelated Corps of Engineers projects on the Trinity River Basin: the Wallisville Dam and Trinity River projects. The case, *Sierra Club* v. *Froehlke*,[321] involved the adequacy of the Corps environmental impact statement on the Wallisville Dam project and resulted in one of the most comprehensive judicial discussions of NEPA to date. After a thorough evaluation of the statement, the cost-benefit analysis, and various agency and public comments, the court concluded that the statement was inadequate primarily because it was limited to the Wallisville Dam project and did not adequately disclose its relationship to the much larger Trinity River project. The court enjoined the Corps from proceeding with the Wallisville Dam until the impact statement for the Trinity River project had been filed or until the Corps proved that the two projects were really separate. With respect to the Wallisville impact statement, the court found that it "lacks the requisite detail" to satisfy the Act's full disclosure requirements, that alternatives to the project were "inadequately considered," and that there was no indication "that genuine efforts have been made to mitigate any of the major impacts on the environment." [322]

The court also criticized Corps "failure to defer to the expert judgment of the federal agencies which have expressed opinions with respect to significant environmental impacts of the Wallisville Dam project" and found of "particular significance" the reference in the Corps cost-benefit analysis to "selected environmental related 'benefits' without also considering and evaluating environmentally related 'costs.' " [323] The court directed that another statement be prepared and that "maximum efforts be expended by the Corps to ensure clarity, thoroughness and objectivity of presentation so that all factors including environmental amenities are fairly portrayed." [324] The case has been appealed. In a related development, the citizens of 17 affected counties voted down a bond proposal that would have provided matching funds to continue with the project.

In addition to these cases, which illustrate judicial concern that environmental impact statements fully and objectively disclose the impact of the project, several recent cases have confirmed the role of courts in reviewing the substance of the agency decision. The most striking affirmation of this judicial role came in the *Gillham Dam* case.[325] There the Corps of Engineers had prepared an environmental impact statement which was subjected to judicial review for adequacy. Having determined that the statement was adequate, the District Court concluded that the Corps job was done and that NEPA "falls short of creating the type of 'substantive' rights" that would allow judicial review of the agency's decision.[326]

On appeal, the Court of Appeals for the Eighth Circuit emphatically disagreed that NEPA created only procedural duties:

> The language of NEPA, as well as its legislative history, make it clear that the Act is more than an environmental full disclosure law. NEPA was intended to effect substantive changes in decision-making. . . . To this end § 101 sets out specific environmental goals to serve as a set of policies to guide agency action affecting the environment.[327]

The Court of Appeals concluded that there is a judicial responsibility to make sure that an agency has not acted "arbitrarily and capriciously" in making decisions affected by NEPA. On the basis of the extensive record prepared in the District Court, the court concluded that this test was met in the case of the Gillham Dam project and affirmed the lower court's judgment dismissing the suit. The Eighth Circuit subsequently reaffirmed its ruling as to the substantive thrust of NEPA in the *Cache River* case.[328]

Decisions in the District of Columbia Circuit, in the Second Circuit, and more recently in the Fourth Circuit, the *New Hope Dam* case,[329] have accepted the view that "district courts have an obligation to review substantive agency decisions on the merits to determine if they are in accord with NEPA." [330] As in the *Gillham Dam* case, these decisions indicate that:

> [t]he review is a limited one for the purpose of determining whether the agency reached its decision after full good faith consideration of environmental factors made under the standards set forth under sections 101 and 102 of NEPA; and whether the actual balance of costs and benefits struck by the agency according to these standards was arbitrary or clearly gave insufficient weight to environmental factors.[331]

These cases clearly indicate that NEPA imposes substantive as well as procedural duties.

**The Supreme Court and SCRAP**—This past year the Supreme Court accepted its first NEPA case, *SCRAP* v. *United States*,[332] which involved a challenge to an action of the Interstate Commerce Commission. The ICC allowed a temporary railroad freight rate increase to take effect without first preparing an environmental impact statement. The precise issue was whether the ICC was required to prepare an environmental impact statement within the statutory 30-day period that it has for making a decision whether to suspend a proposed rate increase pending a full investigation of the reasonableness of the increase.

The case began when firms responsible for most of the rail transport in the Nation applied to the ICC for across-the-board increases on nearly all freight rates. The Commission suspended the proposed rate increase except for a 2.5 percent surcharge, which it allowed to go into effect on an emergency basis pending completion of a full investigation. The plaintiffs in the case, including a group of George Washington University law students describing themselves as Students Challenging Regulatory Agency Procedures (SCRAP), filed suit seeking to enjoin the 2.5 percent increase. They claimed that the increase operated to discourage the movement of recyclable goods in commerce by exacerbating a preexisting rate bias against scrap metal and thus was a major, environmentally significant action requiring the preparation of an environmental impact statement. The ICC argued that the temporary increase was not an environmentally significant action under NEPA but that in any event, if an environmental impact statement were required, it should be prepared and filed during the course of the Commission's subsequent full investigation. According to the ICC, the preparation of a detailed and meaningful environmental impact statement could not be accomplished during the short decision period at the suspension stage. The Federal District Court, however, concluding that an environmental impact statement was required prior to the suspension decision, enjoined the rate increase's application to recyclable materials pending the preparation of such a statement.[333]

The Supreme Court decision,[334] issued on June 18 of this year, did not resolve these NEPA questions. Instead, the Court concluded that Federal courts have no power to issue injunctions with respect to railroad rates that the ICC had decided not to suspend. This conclusion was based on the Court's interpretation of provisions of the Interstate Commerce Act, which the Court held had not been amended by NEPA.

Although resolution of the NEPA issues has thus been postponed, the Supreme Court's opinion did resolve another issue that will be of importance to environmental litigation. That issue involved the question of whether environmental plaintiffs have standing to sue. In the *Mineral King* case,[335] decided the previous term, the Court held that a person seeking review of an agency action claimed to harm the environment must be able to demonstrate specific injury to himself—or members of the group that he represents—as a result of the challenged action. In the *SCRAP* case, the ICC argued that the plaintiffs did not meet this test because the harm that they alleged was too vague and unsubstantiated. The plaintiffs claimed that the general rate increase would inhibit use of recyclable goods instead of virgin materials, causing more litter and other adverse environmental impacts on parks in the Washington metropolitan area.

The Supreme Court concluded that the plaintiffs' allegations were sufficient to support standing. First, unlike *Mineral King,* which involved alleged harm to a particular geographical area of the country, the challenged agency action in the *SCRAP* case involved potential harm to "all persons who utilize the scenic resources of the country, and indeed all who breathe its air." [336] Thus, the claimed injury was necessarily broader in terms of potentially injured parties than in the case of *Mineral King.* The Court found that this difference in the size of the class of potential claimants between the *SCRAP* and *Mineral King* cases is irrelevant.

> [S]tanding is not to be denied simply because many people suffer the same injury. . . . To deny standing to persons who are in fact injured simply because many others are also injured would mean that the most injurious and widespread Government actions could be questioned by nobody.[337]

The Court also concluded that the fact that the alleged injury was less direct and perceptible than in *Mineral King* did not affect the standing issue. The Court admitted that it was being asked to follow a more attenuated cause and effect relationship than in *Mineral King*, but it concluded that although plaintiffs may be required to furnish additional evidence to support their claims if challenged, on the basis of the uncontested pleadings, sufficient standing had been alleged.

The significance of this decision is that it seems to remove most barriers to citizen standing to sue on environmental grounds that might have been thought to remain after *Mineral King*. Last year's Annual Report, for example, noted that *Mineral King* left in doubt the question of who is entitled to sue when Federal action threatens the public as a whole, rather than any particular user group. The answer of the *SCRAP* decision is that where the public as a whole is affected, any member of the public may sue. Although a plaintiff must still show that he is injured, that problem appears to be mainly one of alleging—and demonstrating, if challenged—that the plaintiff is among the group that enjoys the threatened environmental values. If the threat is to a specific geographical area, as in *Mineral King*, the plaintiff must show that his enjoyment of that area is threatened. Where the threat is broader in scope and hence less direct, as, for example, in the case of Federal action that threatens the biological integrity of the oceans or the atmospheric conditions on which life depends, the allegation of injury may be correspondingly broad and less direct.

**Technology Assessment and NEPA**—On June 12, the Court of Appeals for the District of Columbia issued one of the most significant NEPA decisions of the past year. In *Scientists' Institute for Public Information, Inc.* v. *Atomic Energy Commission*,[338] the court ruled that the AEC must file an environmental impact statement on its liquid metal fast breeder nuclear reactor program. The issues before the court were whether an environmental impact statement must be prepared for the research and development program as a whole—rather than for individual facilities as they might be developed—and if so, at what point during the research and development stage the statement is required.

In answering the first question in the affirmative, the court relied extensively on recommendations issued by the Council on May 16, 1972:

> In many cases, broad program statements will be appropriate, assessing . . . the overall impact of a large-scale program or chain of contemplated projects, *or the environmental implication of research activities that have reached a stage of investment or commitment to implementation likely to restrict later alternatives.*[339]

Elaborating on the logic of this recommendation, the court noted that to "wait until a technology attains the stage of complete commercial feasibility before considering the possible adverse environmental effects attendant upon ultimate application of the technology will undoubtedly frustrate meaningful consideration and balancing of environmental costs against economic and other benefits." Further, the court noted: "Once there has been, in the terms of NEPA, 'an irretrievable commitment of resources in the technology development stage, the balance of environmental costs and economic and other benefits shifts in favor of ultimate application of the technology." [340]

With regard to when an environmental impact statement should be prepared on a technology development program, the court noted that agencies should engage in a balancing process and should state their reasons if a decision is made not to prepare one right away. "Statements must be written late enough in the development process to contain meaningful information, but they must be written early enough so that whatever information is contained can practically serve as an input into the decisionmaking process." [341] In the present case the court concluded from the record that the AEC could have no rational basis for deciding that the time was not yet ripe for drafting a statement on the overall breeder reactor program.

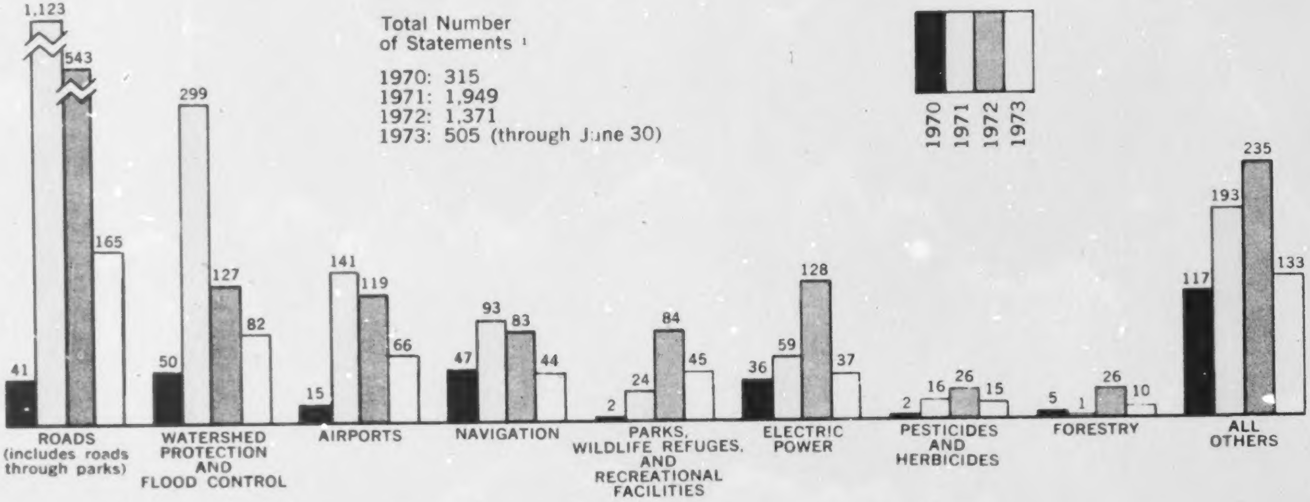
## Administrative Developments

**Filing Patterns of Impact Statements**—Last year's chapter on NEPA reported that as of May 31, 1972, the Council had received draft or final environmental impact statements on 2,933 agency actions. In the following 12 months, CEQ has received statements on another 1,207 actions, of which 926 were final statements, or actions for which the section 102(2)(C) administrative process is now complete. There were still 1,662 draft statements in process.

Looking at environmental impact statement filing in the aggregate provides a useful overall picture of NEPA compliance, but a closer look at patterns of filing by year, by agency, and by type of action indicates an overall trend toward preparing fewer environmental impact statements (see Figures 3 and 4). The number of new statements filed declined from a 1971 high of 1,949 to 1,371 in 1972, and the decline appears to be continuing into 1973. This trend may be attributed largely to a decrease in statements by the Department of Transportation, which more than offset increases by some other agencies. There were 578 fewer statements filed in 1972 than in 1971, with 619 fewer statements from DOT. While the Departments of Agriculture and Interior, the AEC, FPC, and several other agencies collectively filed about 200 more statements in 1972 than in 1971, the Corps of Engineers, GSA, and other agencies filed about 200 fewer.

Figure 3

Environmental Impact Statements Filed with the Council on Environmental Quality for 1970, 1971, 1972, and 1973 (by Type of Action)

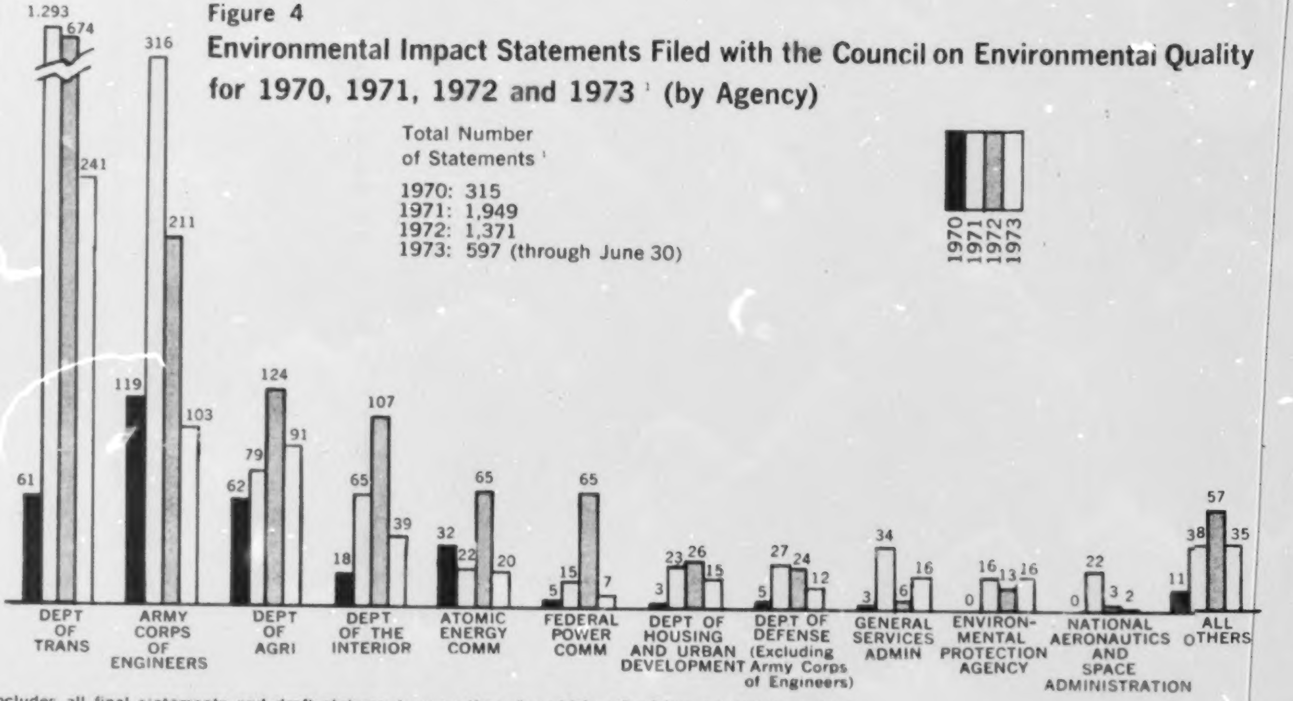


---

[1] Includes all final statements and draft statements on actions for which a final statement has not yet been filed.

Figure 4

**Environmental Impact Statements Filed with the Council on Environmental Quality for 1970, 1971, 1972 and 1973 [1] (by Agency)**



---

[1] Includes all final statements and draft statements on actions for which a final has not yet been filed.

In last year's Report we noted that DOT and Corps projects accounted for 75 percent of all actions for which impact statements had then been filed. As of June 30, this year, the overall proportion shifted slightly downward to 71 percent. Comparing annual figures for the last 3 years demonstrates this downward trend more clearly:

|  | New statements filed | Percentage of Total |  |
|---|---|---|---|
|  |  | DOT | Corps |
| 1971 | 1,949 | 66 | 16 |
| 1972 | 1,371 | 49 | 15 |
| 1973 (though June 30) | 597 | 40 | 17 |

The decrease in DOT statements is largely attributable to better screening of insignificant actions by both the Federal Highway Administration and the Federal Aviation Administration and to the former's efforts to consolidate small highway segments into broader statements. The Corps is nearing the end of a concerted effort to clear the backlog of pre-NEPA projects.

The Council remains concerned about the uneven performance of agencies in filing impact statements. As shown above, most statements are still filed by two agencies. Few of the total number of statements, covering thousands of Federal actions taken each year, involve neither highways, airports, or Corps projects. Uniform standards for when agencies will or will not prepare statements would be impossible to devise in view of the tremendous diversity of agencies and programs. However, the data reviewed above suggest that the divergencies among agencies' filing patterns are unjustifiably wide. The Council will focus on this problem when it reviews agency revisions of NEPA procedures pursuant to its proposed revised impact statement guidelines.

**Quality of Impact Statements**—The Council is also concerned about upgrading the quality of information and analysis presented in impact statements. In November 1972, the General Accounting Office reported on its review of the quality of a number of impact statements prepared by several Federal agencies.[342] The GAO's conclusions, although based on early NEPA statements, suggest that there is much room for improvement in both content and quality. The GAO concluded that the usefulness of the statements that it reviewed was impaired by several common failings—inadequate discussion of the identified environmental impacts, inadequate treatment of reviewing agencies' comments on environmental impacts, and inadequate consideration of alternatives and their environmental impacts.

The adequacy of environmental analyses in 102 statements is a problem for both the agencies that prepare impact statements and the agencies and citizens that comment on them. Agencies preparing statements should set and enforce standards of adequacy. They should provide their employees the necessary guidance and training for meeting these standards.

Even with such a commitment, however, there are major obstacles to be faced. First is the lack of readily available data on some aspects of the environment and on how some types of activities affect the environment. Second, agencies must develop the analytical tools to use the considerable data that are available in the weighing and balancing processes mandated by NEPA. If, for example, a project will increase air pollution, effects on ambient air quality and the impact on achievement of air quality standards should be determined.

Answers to such questions will require more scientific research and better understanding of relationships between natural systems and man's activities. Yet the problem of insufficient data and methodology will persist as long as competition for the research dollar continues. Competition for funds also affects the ability of agencies to hire additional staff to work on impact statements.

Despite various obstacles, agencies are devoting more of their resources to NEPA implementation, and the quality of environmental impact statements is steadily improving. In the northwestern part of the United States, for example, an informal survey recently conducted by EPA's Region X produced an estimate that more than 300 man-years were being devoted to preparing and commenting on impact statements by Federal, state, and local agencies.

## NEPA and Decisionmaking

The true test of NEPA's effectiveness is not merely whether agencies file statements or even whether the statements are models of environmental analysis. Rather, it is whether the results of environmental analysis are reflected in agency decisions that minimize adverse environmental impacts.

The total effect of NEPA on agency decisions cannot be calculated precisely. Many Federal programs and projects are no doubt sounder environmentally because agency management knows that an adequate impact statement must be prepared and environmental factors given appropriate weight in decisions. Because of this internalization of NEPA's objectives, many of the most environmentally undesirable projects and alternatives are screened out of agency consideration prior to any formal action under section 102(2)(C).

At CEQ's annual review of NEPA compliance, agencies reported several examples of NEPA's influence on programs and projects. The following is a selection of examples. Two AEC proposals to store radioactive wastes from nuclear powerplants—the Lyons, Kans., salt mines and the Savannah River bedrock program—have been shelved indefinitely while additional studies are being made. The AEC has also required major changes in the design of cooling systems at the

Indian Point–2, Peach Bottom, and Brunswick nuclear powerplants. Several other plants have undergone changes or have been committed to carry out changes should the result of monitoring and surveillance programs indicate the need.

The Air Force is using the NEPA process to determine the most environmentally acceptable alternative for disposing of its stores of herbicide Orange. The Bureau of Land Management has rejected oil and gas lease applications at Steamboat Lake, Colo., because of environmental considerations raised in the NEPA process. The Corps of Engineers reports that 24 projects have been dropped because of adverse environmental impacts identified through NEPA analyses. Forty-four other Corps projects have been temporarily or indefinitely delayed, and 197 projects have been significantly modified. During impact statement preparation, the Soil Conservation Service modified its Cypress Creek Watershed project in Alabama and Tennessee from 50 miles of channel excavation to 11 miles of intermittent channelizing, with the remaining work limited to clearing and snagging.

As a result of impact statement comments, the State of North Carolina has canceled plans to dredge a channel to a marine resource facility supported by the Economic Development Administration. The new facility will use a nearby marina instead. Review of an EDA statement on a hotel complex for the Grand Portage Indian Reservation turned up problems with the waste water treatment facilities. As a result, EDA agreed to fund a new treatment plant to serve the town and nearby areas as well as the hotel.

Based on information generated by the NEPA review process, the Rockland County, N.Y., legislature dropped plans to run two EPA-funded interceptor sewers through a scenic area. The legislators concluded that the development resulting from sewer construction would destroy the natural character and rural beauty of the area.

HEW's plans for an incinerator to burn wastes from three Federal hospitals in Montgomery County, Md., have been shelved after comments on the draft impact statement showed several preferable alternative means of disposal. NEPA review of HUD's proposed Pike Plaza renewal development in Seattle highlighted a number of problems. While the NEPA process was underway, a local referendum defeated the project and set up instead an historic district and a program of small-scale rehabilitation around a rejuvenated central market.

These are a few examples of specific changes that reflect NEPA's impact on Federal decisionmaking processes. As discussed above, the total extent of NEPA's impact is difficult to determine. But it is clear that NEPA requirements are being built into agency procedures and NEPA's values are being integrated into agency programs.

## State NEPA's[343]

There is a growing movement among the states to adopt legislation or administrative orders patterned after the National Environmental Policy Act of 1969. At least 15 states and the Commonwealth of Puerto Rico have already done so.[344] More than 20 others have under consideration requirements like those of NEPA.

Although similar in thrust, state requirements vary in several ways. Most only require state agencies to prepare impact statements. Others call for statements from local agencies as well, and a few require statements on private actions requiring state or local permits. Enforcement and funding of state impact statement processes also vary widely. Although most states have designated an agency to coordinate the impact statement process, that agency is often without any specific authority to insure compliance. Furthermore, enforcement by citizen action, so important to establishing NEPA's viability at the Federal level, has been made difficult by the lack of adequate mechanisms or funds for publicizing the existence of impact statements. Puerto Rico is discontinuing the use of newspaper advertising because of cost. And no state publishes a periodic centralized list of statements received and available.

The cost of preparing and reviewing impact statements has also proven to be a problem to some extent. It was given as one of the reasons for a gubernatorial veto of an impact statement procedure in New York. In part for financial reasons, the New Mexico legislature suspended impact statement requirements for 1 year pending further study and a report by a newly established State Council on Environmental Quality.

Interest in requirements similar to those in the National Environmental Policy Act has grown among the states since our last Annual Report. It is likely that the implementation of these requirements will generate some problems, but it will also bring the benefits of open and balanced decisionmaking to the states that embrace the process. The Council of State Governments is including a draft state environmental policy act with an impact statement requirement in its 1974 volume on suggested state legislation. The recent report of the Task Force on Land Utilization and Urban Growth Policy has also endorsed the requirement for state environmental impact statement procedures.[345]

## Conclusion

This chapter has discussed a wide range of environmental subjects, raising many issues and developing numerous themes. The diversity of the subject matter defies a neat synthesis, but several common threads, running through much of the chapter, should be noted.

## Secondary Effects

One example is the secondary impacts of environmental protection programs. Implementation of air quality standards and sewer hookup moratoriums can significantly influence the distribution of growth and patterns of land development. State standards for sulfur oxides emissions affect available choices of fuels in energy markets. Strengthened controls over environmentally hazardous pesticides stimulate integrated pest management, with its emphasis on natural controls. As our efforts toward environmental quality continue to expand, we can expect to focus more attention on secondary impacts.

## Institutions

Institutional arrangements are heavily influenced by environmental demands and programs. States are reasserting their basic Constitutional responsibility for land use control, but at the same time a number of individual communities and counties are beginning to establish limits on growth. At a time when the general trend of Federal policy is to decentralize responsibility to state and local governments, there is a purposeful strengthening of Federal authority for pollution control. As the Federal NEPA process is refined and more states adopt comparable programs, analysis of environmental impacts prior to major decisions is becoming an established routine in many government agencies.

## Technological Developments

Throughout most of man's history, technological innovations have been regarded as bonuses—as welcome but not essential improvements—to man's welfare. Increasingly today, the reverse is becoming true. For example, the Nation is now counting on the fast breeder reactor and other technologies to meet anticipated energy needs and thus to sustain the quality of life that we now enjoy. We are planning on substantially improved auto emission control technologies and stack gas cleaning technologies to achieve the air quality standards needed to protect public health. In fact, current laws require these new technologies, explicitly in the case of autos. We now know that technology is no longer a barrier to recycling municipal solid wastes—which we hope will lead in the direction of reducing demands for virgin raw materials and alleviating the solid waste disposal problem. The technology known as integrated pest management is rapidly developing, providing an opportunity to control pests without sole reliance on pesticides. Although technology undoubtedly causes some environmental problems, we are increasingly realizing that new technology is one of our most promising means of solving such problems.

## The Role of the Courts

A major factor in the current status of environmental programs is court decisions, many of which have resulted from legal actions by citizens against government agencies. As with environmental legal actions against industry,[346] the number of actions against Federal agencies has mushroomed in recent years. Much of this litigation is under NEPA, but there has also been a large volume of litigation under the Clean Air Act and under the Amendments to the Federal Water Pollution Control Act of 1972.

The requirements of NEPA are very broadly worded, virtually ensuring that application of the law to specific circumstances would require definitive judicial interpretation. In addition, NEPA forced a revolution in decisionmaking on many agencies that were unaccustomed and unwilling to consider the environment any further than was clearly required.

Litigation under pollution control laws arises for somewhat different reasons. Because of disillusionment with the performance of administrative agencies, many legislators, courts, and citizens no longer believe that the agencies should be given broad discretion to do what is best. The unresponsiveness of many administrative agencies, their intimacy and sympathies with interests that they were established to regulate, and their inaccessibility to the public has in recent years led legislators to specify agency duties with great precision and courts to show less deference to agency judgments.

This new attitude toward administrative agencies has affected pollution control programs. Their past failures were due to weakness in both legislative authority and administrative performance. In the new Federal antipollution laws, the Congress not only strengthened administrative authorities but established deadlines and other requirements for the exercise of these authorities as well. It also established mechanisms for citizens to challenge agency action or inaction and to obtain judicial review of standards.

The citizen action tools created by the Congress were in little danger of being unused. While public concern for the environment was supporting vigorous new legislation, it was also spawning the environmental legal action groups discussed in this and previous Annual Reports.

Laws that set demanding deadlines for agency actions—such as the Clean Air Act and the Federal Water Pollution Control Act—reduce the problem of unreasonably delayed actions. At the same time, such laws create problems of administrative feasibility when substantive complexities prevent literal adherence to deadlines. One example under the Clean Air Act which resulted in litigation to compel EPA action was transportation control measures for state implementation plans.

Other factors could be cited to explain the volume of litigation, but it is important to bear in mind the net effect of litigation. In environmental cases the courts are serving two of their basic functions—to resolve disputes over the meaning of new and complex laws and to issue orders when necessary to enforce compliance with the law. Given the complexity of environmental legislation, the role of the courts in serving as final arbiter has necessarily expanded.

## Citizen Support

The most important factor in the success of environmental protection programs is the support of the public. The continuing citizen support for environmental improvement during the past year is only partially reflected in the body of this chapter. The November elections produced many examples of broad public concern for the environment. Voters in New York State approved by a strong majority a $1.15 billion bond issue to finance pollution control and solid waste management facilities and the public acquisition of environmentally sensitive areas. Florida voters approved a $240 million bond issue to purchase environmentally endangered lands. Massachusetts and Washington voters ratified environmental bills of rights. Of the 57 Congressional or gubernatorial candidates endorsed by the League of Conservation Voters, 43 were elected. These and other examples underline the long-term commitment of the public to a quality environment.

## Footnotes

1. 42 U.S.C. § 1857 *et seq.*, 49 U.S.C. §§ 1421, 1430 (originally enacted as P.L. 91-604, 84 Stat. 1676 (1970)).
2. 42 U.S.C. §§ 1857c-4, 1857c-5 (1970).
3. 42 U.S.C. § 1857f-1 (1970).
4. See S. Rep. No. 91-1196, 91st Cong., 2d Sess. 23-28 (1970).
5. See Council on Environmental Quality, *Environmental Quality—The Third Annual Report of the Council on Environmental Quality* 110-116 (1972) [hereinafter cited as CEQ, *Third Annual Report*].
6. By regulations issued on May 14, the Environmental Protection Agency (hereinafter cited as EPA) brought to 19 the number of jurisdictions with fully approved implementation plans. Seven additional states now have plans with fully approved regulatory provisions. 38 *Fed. Reg.* 12696 (1973).
7. EPA, Division of Certification and Surveillance, Automobile Exhaust Emission Survey: A Summary (March 1973).
8. Natural Resources Defense Council v. EPA, 4 ERC 1945, 475 F.2d 968 (D.C. Cir. 1973).
9. Opening statement by Acting Administrator, Transportation Control Plans, EPA Press Conference (June 15, 1973).
10. Riverside v. Ruckelshaus, 4 ERC 1729, 3 ELR, 20043 (C.D. Cal. 1972).
11. 38 *Fed. Reg.* 2194 (1973).

12. Data derived from: EPA, Office of Air Programs, *Compilation of Air Pollutant Emission Factors* (Revised, February 1972); Hirst, *Energy Intensiveness of Passenger and Freight Transport Modes 1950-1970* (1973); CEQ, *Energy and the Environment: Electric Power* (1973). For rapid rail mass transit, emission data were based upon average emissions from fossil fuel powerplants.
13. Opening Statement, *supra* note 9.
14. 42 U.S.C. § 1857c–6 (1970).
15. 40 C.F.R. § 60 (1973); 38 *Fed. Reg.* 15406 (1973) [proposed standards for asphalt concrete plants, secondary brass and bronze ingot production plants, petroleum refineries, petroleum storage tanks, secondary lead smelters, iron and steel plants, and sewage incinerators].
16. Essex Chemical Corp. v. Ruckelshaus, No. 72–1073 (D.C. Cir., filed January 21, 1972); Appalachian Power Co. v. EPA, No. 72-1079 (D.C. Cir., filed Jan. 21, 1972).
17. 42 U.S.C. § 1857c-(a)(2)(B)(1970).
18. Natural Resources Defense Council v. EPA, 4 ERC 1945, 475 F. 2d 968 (D.C. Cir. 1973).
19. 38 *Fed. Reg.* 15194 (1973).
20. 42 U.S.C. § 1857 (1970)
21. Sierra Club v. Ruckelshaus, 344 F. Supp. 253, 4 ERC 1205 (D.D.C. 1972), *affirmed*, 4 ERC 1815 (D.C. Cir. 1972), *cert. granted*, 41 U.S.L.W. 3392 (U.S. Jan. 15, 1973), *affirmed by tie vote*, 41 U.S.L.W. 4825 (U.S. June 11, 1973).
22. Sulfur Oxide Control Technology Panel (SOCTAP), Final Report on Projected Utilization of Stack Gas Cleaning Systems by Steam-Electric Plants 7-9 (1973) [report of an ad hoc panel reporting to the Federal Interagency Committee on Evaluation of State Air Implementation Plans, chaired by EPA].
23. 42 U.S.C. § 1857c-5 (1970).
24. President's April 18, 1973 Message to the Congress on Energy, 9 *Presidential Documents* 389 (April 23, 1973).
25. Letter from Administrator of EPA to State Governors, Dec. 18, 1972.
26. 42 U.S.C. § 1857d-1 (1970).
27. See speech by Willam D. Ruckelshaus, Administrator of EPA, to the Highway Research Board in Washington, D.C., Jan. 24, 1973.
28. EPA Hearings on Applications for Suspension of 1975 Motor Vehicle Exhaust Emission Standards, Tr. 176-178 (March 1973).
29. Letter to the Editor from Robert W. Fri, Acting Administrator of EPA, in Wall Street Journal, June 11, 1973 at 14, col. 4.
30. See note 4, *supra*.
31. 42 U.S.C. § 1857f-1(b) (1970).
32. 38 *Fed. Reg.* 10317 (1973).
33. International Harvester v. Ruckelshaus, 4 ERC 2041, 3 ELR 20133 (D.C. Cir. 1973).
34. *Id.* at 2049-2055.
35. National Academy of Sciences, Committee on Motor Vehicle Emissions, Report to EPA and the Congress under Section 202(c) of the Clean Air Amendments of 1970 [42 U.S.C. § 1857f-1(c)] (Feb. 12, 1973).
36. Decision of the Administrator of EPA, *In re: Applications for Suspension of 1975 Motor Vehicle Exhaust Emission Standards* 33–35 (April 11, 1973).
37. E.g., Kennecott Copper Corp. v. EPA, 462 F. 2d 846, 2 ELR 20117 (D.C. Cir. 1972) [challenging secondary ambient air quality standard for sulfur oxides]; see also cases cited in note 16, *supra*.
38. 38 *Fed. Reg.* 11355 (1973).
39. Hearings on $NO_x$ standards, statement of William D. Ruckelshaus, Administrator of EPA, before the Subcommittee on Air and Water

Pollution, Committee on Public Works, U.S. Senate, 93rd Cong., 1st Sess., April 17, 1973.

40. EPA Reevaluates Nitrogen Dioxide Air Pollution Levels in the U.S., EPA Press Release (June 5, 1973).
41. See note 27, *supra* [7-12 percent loss in fuel economy from NO$_x$ catalyst].
42. P.L. 92-500, 86 Stat. 816 (1972).
43. See Council on Environmental Quality, *Environmental Quality—the Second Annual Report of the Council on Environmental Quality* 217-221 (1971) [hereinafter cited as CEQ, *Second Annual Report*].
44. *Id.* at 218; CEQ, *Third Annual Report* 11-16 (1972).
45. P.L. 92-500, §§ 301(a), 402, see §§ 502(12), (14), (1972).
46. *Id.*, § 402. EPA has issued final regulations governing the issuance of permits. See 37 *Fed. Reg.* 28390 (1972) [state issuance]; 38 *Fed. Reg.* 13528 (1973) [EPA issuance].
47. *Id.*, § 402, see also § 301(b).
48. *Id.*, § 301(b)(1)(B).
49. *Id.*, § 301(b)(1)(A).
50. *Id.*, §§ 301(b)(1)(C), 302, 303(a)-(d).
51. *Id.*, §§ 201(g)(2)(A), 301(b)(2)(B).
52. *Id.*, § 301(b)(2)(A).
53. *Id.*, § 302.
54. *Id.*, § 306.
55. *Id.*, § 307(a).
56. *Id.*, § 311.
57. *Id.*, § 307(b).
58. *Id.*, § 303(e).
59. *Id.*, § 305.
60. *Id.*, § 309.
61. *Id.*, § 301(a).
62. *Id.*, § 402(k).
63. *Id.*, § 505.
64. EPA. *The Challenge of the Environment: A Primer on EPA's Statutory Authority* 18 (1972).
65. P.L. 92-500, §§ 301, 302, 309, 402 (1972).
66. See S. Rep. No. 92-414, 92d Cong., 1st Sess. 7, 11-12 (1971).
67. The Water Quality Act of 1965, P.L. 89-234, 70 Stat. 498, § 5, 33 U.S.C. § 1160 (1965).
68. P.L. 92-500, §101(a) (1972).
69. *Id.*, § 301(b)(2)(A).
70. *Id.*, § 302(a).
71. *Id.*, §§ 203(a), 205(b)(1).
72. *Id.*, § 207.
73. President's Oct. 17, 1972 Veto Message concerning S. 2770, 8 *Presidential Documents* 1531 (Oct. 23, 1972).
74. Letter from President Nixon to William D. Ruckelshaus, Administrator of EPA, announced in EPA Press Conference, Nov. 28, 1972.
75. P.L. 92-500, §§ 205, 207 (1972).
76. New York City v. Ruckelshaus, 5 ERC 1305, 3 ELR 20410 (D.D.C. 1973). There have also been recent decisions in Federal District Courts in Illinois and Virginia reaching the same result.
77. P.L. 92-500, § 204(b)(1)(B) (1972). EPA has issued proposed regulations governing user charges and industrial cost recovery. 38 *Fed. Reg.* 13523 (1973).
78. P.L. 92-500, § 204(b)(1) (A), (C) (1972).
79. Exec. Order No. 11,574, 3 C.F.R. 188 (1970).
80. See United States v. Standard Oil Co., 384 U.S. 224, 86 S.Ct. 1427 (1966).
81. 36 *Fed. Reg.* 6564 (1971).

82. See EPA, *The First Two Years: A Review of EPA's Enforcement Program*, 162-180 (1973).
83. Kalur v. Resor, 3 ERC, 1458, 1 ELR 20637 (D.D.C. 1971); U.S. v. Pennsylvania Industrial Chemical Corp., 4 ERC 1241, 461 F.2d 468 (3d Cir. 1972), *reversed*, 5 ERC 1332, 93 S.Ct. 1804 (S.Ct. 1973).
84. P.L. 92–500, § 402 (1972).
85. *Id.*, § 402(a)(5). Memo from Acting Deputy Administrator of EPA to Regional Administrators regarding NPDES permits, June 25, 1973. Eighteen states and territories issued permits for 184 facilities prior to March 19, 1973. They are: American Samoa, California, Connecticut, Georgia, Hawaii, Indiana, Iowa, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Ohio, Oregon, South Carolina, Virginia, Washington, and Wisconsin.
86. P.L. 92–500, § 101(b) (1972).
87. EPA, *Water Strategy Paper* 1 (Feb. 27, 1973).
88. P.L. 92–500, § 402(K) (1972).
89. EPA, *Water Strategy Paper* 17 (Feb. 27, 1973).
90. *Id.*, 8, 11, 21-23.
91. *Id.*, 18-20; P.L. 92–500, § 212 (1972).
92. EPA, *Water Strategy Paper* 20-21 (Feb. 27, 1973).
93. 42 U.S.C. § 1857h-2 (1970).
94. P.L. 92-500, §§ 402, 505 (1972).
95. *Id.*, § 101(e).
96. 38 *Fed. Reg.* 5038 (1973).
97. CEQ, *Third Annual Report* 13-16 (1972).
98. Council on Environmental Quality, *Environmental Quality—The First Annual Report of the Council on Environmental Quality* (1970).
99. CEQ, *Third Annual Report* 171-172 (1972); CEQ, *Second Annual Report* 44 (1971).
100. 5 ERC 1119, 3 ELR 20228 (N.D. Ill. 1973).
101. U.S. Const., article I, § 8, cl. 3.
102. See, e.g., Bibb v. Navajo Freight Lines, 359 U.S. 520, (1959); South Carolina Highway Department v. Barnwell, 303 U.S. 177, 58 S.Ct. 510 (1939).
103. 5 ERC 1119, 1124, 3 ELR 20228, 20231 (N.D. Ill. 1973).
104. P.L. 92–532, 86 Stat. 1052, 1972 *U.S.C. Congressional and Administrative News* 1233 (1972).
105. P.L. 92-500, 86 Stat 816, § 403 (1972).
106. 38 *Fed. Reg.* 8725 (1973).
107. 38 *Fed. Reg.* 12872 (1973).
108. 3 ELR 40329 (1973).
109. H.R. 5091, 93rd Cong., 1st Sess. (1973).
110. P.L. 92–532, § 106(d) (1972).
111. 93 S.Ct. 1590, 5 ERC 1209 (S.Ct. 1973).
112. 33 U.S.C. § 1161(o) [now § 311(o) of P.L. 92-500] (1972).
113. Florida Oil Spill Prevention and Pollution Control Act, L. Fla. 1970, c. 70-244.
114. P.L. 92-532, § 311 (1972).
115. S. 1735, H.R. 5368, 92nd Cong., 1st Sess. (1973).
116. Safe Drinking Water Act of 1973, S.B. 433, 92nd Cong., 2nd Sess. (passed June 22, 1973).
117. See, e.g., National Water Commission, *Review Draft: Proposed Report of the National Water Commission* 4-81 to 4-83 (Nov. 1972).
118. P.L. 92-500, § 315 (1972).
119. See, e.g., Clean Air Act, 42 U.S.C. § 1857c-7(a) (1970); Federal Water Pollution Control Act, P.L. 92-500, §§ 307(a), 502(13) (1972).
120. The Insecticides Act, 7 U.S.C. §§ 121-134, 36 Stat. 331 (1910).
121. 42 U.S.C. § 2011 *et seq.* (1954).

122. Council on Environmental Quality, *Integrated Pest Management* 3 (1972).

123. *In re Stevens Industries, Inc.*, et al. [consolidated DDT hearings], I.F. and R. No. 63 *et seq.* (June 14, 1972); see also CEQ, *Third Annual Report* 142–126 (1972).

124. P.L. 92–516, 86 Stat. 973 (1972).

125. Formerly 7 U.S.C. § 315 *et seq.* (1947). Technically, FEPCA amends FIFRA, but for practical purposes, FEPCA is a comprehensive new law.

126. 38 *Fed. Reg.* 1142, 3002 (1973).

127. FIFRA, controlling only the use of products in interstate commerce, remains in effect until regulations are promulgated under FEPCA. 86 Stat. 998, § 4(b) (1972). Regulations under FEPCA for registrations of products used in intrastate as well as interstate commerce are not required to be promulgated until October 1974. 86 Stat. 998, § 4(c)(1) (1972).

128. 38 *Fed. Reg.* 9080 (1973).

129. See Note 123, *supra.*

130. Dow Chemical Co. v. Ruckelshaus, 5 ERC 1244, 3 ELR 20345 (8th Cir. 1973).

131. 29 U.S.C. § 651 *et seq.* (1970); 38 *Fed. Reg.* 17214 (1973).

132. The Occupational Health and Safety Act of 1970, P.L. 91–595, 84 Stat. 1590 (1970).

133. See note 124, *supra.*

134. The Florida Peach Growers Association, Inc. v. U.S. Department of Labor, Peter Brennan, Secretary, John H. Stender, Assistant Secretary, No. 73–1934 (Nos. 73–2279, 73–2283) (5th Cir. July 10, 1973).

135. U.S. Department of Agriculture, unpublished data, 1973.

136. R. Strong, cited in R. F. Smith, *Solutions to Problems Associated with Agricultural Chemicals: What Is Being Done by the Universities* (mimeograph 1971).

137. Council on Environmental Quality, *Toxic Substances* (1971).

138. S. 1478, H.R. 5276, H.R. 5390, 92d Cong., 1st Sess. (1971).

139. S. 1478, *supra* note 138.

140. S. 888, H.R. 5087, 93rd Cong., 1st Sess. (1973).

141. Interdepartmental Task Force on PCB's, *Polychlorinated Biphenyls and the Environment* (1972).

142. 37 *Fed. Reg.* 5705 (1972); 37 *Fed. Reg.* 10003 (1972).

143. Organization for Economic Cooperation and Development, Decision of the Council on Protection of the Environment by Control or Polychlorinated Biphenyls, adopted Feb. 13, 1973 (1973).

144. Kleopfer and Fairless, "Characterization of Organic Components in a Municipal Water Supply," 6 *Environmental Science and Technology* 1026 (1972), and "Are You Drinking Biorefractories Too?" in 7 *Environmental Science and Technology* 14 (1973).

145. Van Duuren, Katz, Goldschmidt, Frenkel, and Sivak, "Carcinogenicity of Halo-Ethers 2 Structure-Activity Relationships of Analogs of BIS (Chlormethyl ether)," *J. Nat'l Cancer Inst.* 1431-1439 (1972).

146. National Academy of Sciences-National Research Council, Advisory Committee on the Biological Effects of Ionizing Radiations, *The Effects on Populations of Exposures to Low Levels of Radiation* (1972) [hereinafter cited as the *BEIR Report*].

147. EPA, Office of Radiation Programs, *National Radiation Protection Program Strategy and Plan* (1972).

148. *BEIR Report, supra* note 146, at 29–37.

149. See Klement, Miller, Minx, and Schleien, *Estimates of Ionizing Radiation Doses in the U.S. (1966–2000)* Office of Radiation Programs/Criteria and Standards Division Report No. 72-1 (1972); medical dosage represents preliminary estimates of "abdomen dose" only.

150. Federal Radiation Council, Report No. 1 (1960) [in 1970, EPA assumed the functions of the FRC].
151. *BEIR Report, supra* note 146, at 18.
152. *BEIR Report, supra* note 146, at 2.
153. *Id.*, at 7.
154. 10 C.F.R. § 50.34a (1971).
155. U.S. Atomic Energy Commission *Environmental Impact Statement, Proposed Rulemaking Action: Numerical Guidelines for Design Objectives and Limiting Conditions for Operation to Meet the Criterion "As Low as Practicable" for Radioactive Material in Light-Water Cooled Nuclear Power Reactor Effluents* (Final, May 9, 1973).
156. 36 *Fed. Reg.* 12247 (1971).
157. U.S. Atomic Energy Commission, *Environmental Impact Statement, Proposed Rulemaking Action: Acceptance Criteria for Emergency Core Cooling Systems for Light-Water-Cooled Nuclear Power Reactors* (Final, May 9, 1973).
158. Nader, et al. v. Dixie Lee Ray, et al., No. 1058–73 (D.D.C. May 31, 1973).
159. 42 U.S.C. § 2232(a) (1954).
160. Nader and Friends of the Earth v. Dixie Lee Ray and U.S. Atomic Energy Commission, No. 73–1733 (D.C. Cir. June 28, 1973).
161. U.S. Atomic Energy Commission, *Environmental Survey of the Nuclear Fuel Cycle* (1972).
162. 10 C.F.R. § 50 (1971).
163. *BEIR Report, supra* note 146, at 3.
164. *Id.*, at 13.
165. *Id.*, at 10.
166. P.L. 92–574, 86 Stat. 1234 (1972).
167. See, e.g., EPA, *Report to the President and the Congress on Noise* 2-79 (1971) [aircraft noise]; Department of Transportation, *Transportation Noise and Its Control* 1, 10 [highway vehicle noise].
168. P.L. 90-411, 49 U.S.C. § 1431 (1968).
169. 34 *Fed. Reg.* 18355, 18362 (1969).
170. Noise Control Act of 1972, P.L. 92–574, § 7, 3 ELR 41501 (1972).
171. E.g., American Airlines, Inc. v. Town of Hempstead, 272 F. Supp. 226 (E.D. N.Y. 1967), *affirmed on another ground*, 398 F.2d 369 (2d Cir. 1968), *cert. denied*, 393 U.S. 1017 (1969); American Airlines, Inc. v. Audobon Park, 297 F. Supp. 207 (W.D. Ky. 1968), *affirmed per curiam*, 407 F.2d 1306 (6th Cir. 1969), *cert. denied*, 396 U.S. 845 (1970).
172. E.g., Port of New York Authority v. Eastern Airlines, Inc., 259 F. Supp. 745 (E.D. N.Y. 1966); see H.R. Rep. No. 601, 91st Cong., 1st Sess. 11–12 (1970).
173. See S. Rep. No. 92-1160, 92d Cong., 2d Sess. 10–11 (1972); H.R. Rep. No. 92–842, 92d Cong., 2d Sess. 10 (1972).
174. 41 U.S.L.W. 4600 (U.S. May 15, 1973).
175. 93 S.Ct. 1590, 5 ERC 1209 (S.Ct. 1973).
176. *Id.*, at 4603, note 14.
177. CEQ, *Third Annual Report* 212-213 (1972).
178. P.L. 92-574 § 6(e) (1972)
179. *Id.*, §§ 17, 18.
180. *Id.*, § 6.
181. HUD Circular 1390.2, *Noise Abatement and Control: Departmental Policy, Implementation Responsibilities, and Standards* (1971).
182. N.Y. City Admin. Code, ch. 57, part III (Oct. 1972).
183. EPA, Office of Solid Waste Management Programs, unpublished data, 1973.
184. P.L. 89–272, Title II, 79 Stat. 997 (1965).

185. *The Budget of the U.S. Government, Fiscal Year 1974—Appendix 774-780* (1973) [detailed figures available from Environmental Protection Agency].
186. General Services Administration, *Fact Sheet on Recycled Paper,* issued and revised periodically [available upon request from GSA, Washington, D.C.].
187. EPA, Office of Solid Waste Management Programs, *supra* note 178.
188. S. 1086, H.R. 4873, 93d Cong., 1st Sess. (1973).
189. Midwest Research Institute, *Resource Recovery: The State of Technology* (1973) [a report to the Council on Environmental Quality].
190. Business Publishers, Inc., *Solid Waste Report* 181 (Sept. 18, 1972).
191. *Id.*, at 182.
192. "St. Louis Uses Trash to Make Electricity," Washington Post, Feb. 11, 1973, § E at 11.
193. *National Center for Resource Recovery,* Press Release (March 7, 1973).
194. "New Orleans Appeals Court Decision," *Solid Waste Report* 125 (June 25, 1973); see also *Solid Waste Report* 104 (May 28, 1973).
195. "Can Solid Waste Turn a Profit?" New York Times, Oct. 1, 1972, § F at 15.
196. EPA, *Report to Congress on Resource Recovery* 5 (1973).
197. *Id.*, at 8.
198. National Solid Wastes Management Association, 1 *The Private Sector in Solid Waste Management* 1.1 (1972).
199. National Commission on Productivity, *Opportunities for Improving Local Government Solid Waste Productivity* (1973).
200. *Id.*
201. Conn. Pub. Act 459 ["Solid Waste Management Act"], June 20, 1973.
202. N.J. P.L. 1973, ch. 39.
203. Communication from William McDowell, Chairman of New Jersey Meadowlands Commission, Hackensack, N.J., to W. Roger Strelow of CEQ, May 1973.
204. Vermont, Act 252 of 1972 (April 7, 1972).
205. Ch. 745 (1971) Ore. Laws.
206. EPA, Office of Solid Waste Management Programs, *Oregon's Bottle Bill: The First Six Months* (1973).
207. "The Gas Shortage Catches up with Texas," 2259 Business Week 28 (Dec. 16, 1972).
208. Telephone conversion of Marvin I. Singer of CEQ with Evan L. Sneddon, Administrative Director of Building Services, Denver Public Schools, June 1, 1973.
209. "The Mounting Cost of the Gas Shortage," 2260 Business Week 19 (Dec. 23, 1972); G. Smith, "Northeast Is Bracing Itself for Possible Energy Crisis," New York Times, Jan. 15, 1973, at 1, col. 2.
210. "Jet Fuel Shortage at New York Airports Disrupts Operations of Several Airlines," The Wall Street Journal, Jan. 11, 1973, at 6, col. 2.
211. Office of Emergency Preparedness, *Survey of Fuel and Energy Problems for Spring and Summer 1973* (April 1973).
212. Public hearings on oil, statement of John N. Nassikas, Chairman of Federal Power Commission, before the Cost of Living Council, Feb. 8, 1973.
213. Loehwing, "More Oil Refineries—Contractors Will Work at Capacity for the Next Five Years," Barron's, May 28, 1973, at 3.
214. President's April 18, 1973 Message to the Congress on Energy, 9 *Presidential Documents* 389 (April 23, 1973).
215. F. Bosselman and D. Dallies, *The Quiet Revolution in Land Use Control* (1971).
216. P.L. 92-583, 86 Stat. 1280 (1972).

217. S. 1041 [public domain land management], S. 935, H.R. 4874 [power-plant siting], S. 923, H.R. 4863 [mined area protection], 93rd Cong., 1st Sess. (1973).
218. H.R. 5334, 93rd Cong., 1st Sess. (1973).
219. 42 U.S.C. § 4001 *et seq.* (1968).
220. S. 1495, H.R. 6524, 93rd Cong., 1st Sess. (1973).
221. Florida Environmental Land and Water Management Act, Fla. Stat. Ann., § 308 *et seq.*
222. Ore. Rev. S. Bill No. 100 (1973).
223. Cal. Pub. Res. Code § 27000 et seq. (West, 1973 supp.).
224. N.J. Stat. Ann. 13·9A–1 *et seq.*
225. N.J. Coastal Facilities Review Act, A. 1429.
226. Ch. 175, Vol. 58, Laws of Del.
227. See U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Coastal Zone Management Task Force, *Report on the Status of State Coastal Zone Management Programs* [compiled and periodically updated]
228. Rev. Code Wash., ch. 90.58, ratified by electorate in Nov. 1972 as Initiative 43B.
229. N.Y. Tidal Wetlands Act, Ass. Bill 379–B.
230. N.Y. Exec. L. §§ 800–810 (McKinney 1971).
231. N.Y. Laws of 1973, ch. 348 (May 22, 1973).
232. N.J. Laws of 1972, ch. 185.
233. Vt. Stat. Ann. tit. 10, § 6021 *et seq.*
234. Cal. Pub. Res. Code § 21000; Cal. Environmental Quality Act of 1970, amended by chapter 1154 of the Statutes of 1972 (March 7, 1973); Cal. Gen. Laws Ann. §§ 11000–11030 (Deering 1972); N.Y. Real Prop. Law § 3376 (McKinney 1968).
235. Mich. Comp. Laws § 565.801 *et seq.* (Oct. 30, 1972).
236. 15 U.S.C. § 1701 *et seq.* (1968).
237. Task Force on Land Use and Urban Growth, *The Use of Land: A Citizens' Policy Guide to Urban Growth* 33 (1973) [a prepublication copy of a report to the Citizens' Advisory Committee on Environmental Quality].
238. *Id.*, at 57–60.
239. Boca Raton, Fla., City Charter § 12.09, "Limitation of Number of Unit Dwellings" (Nov. 7, 1972).
240. Hollywood, Fla. Ord. 073–33 (May 16, 1973).
241. Hallandale, Fla. Moratorium, Resolution 1157 (Jan. 23, 1973); Resolution 1161 (Feb. 22, 1973).
242. Dade County, Fla., Ord. 7289 (Dec. 5, 1972).
243. See, e.g., Palm Beach County, Fla. Ord. 72–5 (Feb. 25, 1972); Collier County, Fla., Action of the Board of Supervisors (May 29, 1973).
244. Fairfax County Government, Press Release, April 10, 1973.
245. Fauquier County, Va., Emergency Ord. for 60 days (later extended for 4 more months) (March 8, 1973).
246. Montgomery County, Md., Resolution 7–1071 (Feb. 13, 1973); Adequate Public Facilities Act, Ordinance 7–41 (June 26, 1973); Office of Planning and Capital Programming of the Montgomery County Government, *A Comprehensive Sewer Service Policy for Montgomery County* (May 1973).
247. Narragansett, R.I. Gen. Ord., ch. 229 (Feb. 7, 1973).
248. Association of Bay Area Governments (Berkeley, Cal.), Resolution 1–73, "Formulation of a Long-Range Regional Growth Policy" (Feb. 22, 1973).
249. Associated Homebuilders v. Livermore and Pleasanton, Case #425754, Alamenda County Superior Court (Dec. 29, 1972 and Jan. 15, 1973).
250. Palo Alto, Cal. Municipal Code ch. 18.71 (June 5, 1972); Palo Alto Ord. 2671 (Aug. 14, 1972).

251. The draft *Environmental Plan* is available from the Department of Environmental Conservation, Albany, N.Y., 12201.

252. E.g., Upper Mississippi River Wildlife and Fish Refuge Act, 16 U.S.C. § 721 *et seq.* (1924).

253. P.L. 91–190, 42 U.S.C. § 4321 *et seq.* (1970).

254. 16 U.S.C. § 661 *et seq.* (1946).

255. See discussion in the NEPA section of this chapter.

256. 42 U.S.C. §§ 1857c–4, 1857c–5 (1970).

257. See, e.g., P.L. 92-500, § 101(a) (1972).

258. 16 U.S.C. § 668aa *et seq.* (1969).

259. S. 1592, H.R. 4755, 93rd Cong., 1st Sess. (1973).

260. 16 U.S.C. §668aa(d) (1969).

261. White House Fact Sheet accompanying President's State of the Union Message to the Congress on Natural Resources and Environment (Feb. 16, 1973).

262. Cited in 3 ELR 40336.

263. 16 U.S.C. § 1361 *et seq.* (1972).

264. Advisory Committee on Predator Control, *Predator Control—1971* (1972) [a report to the U.S. Department of the Interior and the Council on Environmental Quality].

265. Executive Order No. 11643, 37 *Fed. Reg.* 2875 (1972).

266. 37 *Fed. Reg.* 5718 (1972).

267. Letter from Secretary of the Interior to Speaker of the U.S. House of Representatives, transmitting proposed predator control legislation, Feb. 15, 1973.

268. 7 U.S.C. § 426 *et seq.*, 46 Stat. 1468 (1931).

269. S. 887, H.R. 4759, 93rd Cong., 1st Sess. (1973); see H.R. 13152, 92nd Cong., 2d Sess. (1972).

270. 16 U.S.C. § 1131 *et seq.* (1964).

271. U.S. Department of the Interior and U.S. Department of Agriculture, unpublished information, 1973.

272. *Id.*; see "The Wilderness Record," 36 *The Living Wilderness* 5–9 (1972).

273. S. 938, H.R. 4793, 93rd Cong., 1st Sess. (1973).

274. 16 U.S.C. § 1131(c) (1964).

275. S. 938, H.R. 4793, *supra* note 258, § 3.

276. S. 316, H.R. 1758, 93rd Cong., 1st Sess. (1973).

277. 16 U.S.C. § 1271 *et seq.* (1968).

278. S. 921, H.R. 4864, 93rd Cong., 1st Sess. (1973).

279. S. 883, H.R. 4469, 93rd Cong., 1st Sess. (1973).

280. CEQ, *Third Annual Report* 190 (1972); *Second Annual Report* 70 (1971).

281. Cal. Pub. Res. Code, ch. 1.4, § 5093.50 of Div. 5; ch. 1259 of statutes of 1972 (March 7, 1973).

282. Wilderness Society v. Hickel, 325 F. Supp. 422, 1 ERC 1335 (D.D.C. 1970).

283. 42 U.S.C. § 4332 (1970).

284. Wilderness Society v. Morton, 4 ERC 1977, 3 ELR 20085 (D.C. Cir. 1973).

285. 5 ERC 1208, 41 U.S.L.W. 3527 (U.S. April 2, 1973).

286. S. 1081, 93rd Cong., 1st Sess. (1973).

287. S. 970, 93rd Cong., 1st Sess. (1973).

288. S. 993, 93rd Cong., 1st Sess. (1973).

289. 30 U.S.C. § 185, 41 Stat. 449 (1920).

290. E.g., J. Sax, *Defending the Environment* 175 (1971).

291. Data in the following paragraphs are derived from communications between the Secretary of the Interior to the Speaker of the U.S. House of Representatives, transmitting legislation to protect Big Cypress,

Feb. 15, 1973, and from CEQ, *Third Annual Report* 136-137, 317 (1972).

292. S. 920, H.R. 4866, 93rd Cong., 1st Sess. (1973).

293. U.S. Secretary of Agriculture, Press Release (March 29, 1973).

294. See H.R. Report No. 93–243, 93rd Cong., 1st Sess. (1973).

295. See CEQ, *Second Annual Report* 92 (1971).

296. H.R. 3620, 93rd Cong., 1st Sess. (1973).

297. Byrd, *History of the Dividing Line* (1728).

298. See CEQ, *Third Annual Report* 311, 328–331 (1972).

299. Gateway National Recreation Area Act, P.L. 92–589 (1972); Golden Gate National Recreation Area Act, P.L. 92–592 (1972).

300. Federal Property Council, unpublished material, July 1973.

301. S. 922, H.R. 4865, 93rd Cong., 1st Sess. (1973).

302. 42 U.S.C. § 4321 *et seq.* (1970).

303. 38 *Fed. Reg.* 10856 (1973) [hereinafter cited as *Guidelines*].

304. 36 *Fed. Reg.* 7724 (1971).

305. *Guidelines*, § 2.

306. *Id.*, § 6(d).

307. *Id.*, § 8(a)(ii)(B).

308. *Id.*, § 8(a)(i).

309. *Id.*, §§ 6(b), 8(a)(ii)(A), Appx. II, § 8(a)(iii).

310. *Id.*, § 3(a).

311. *Id.*, § 7(a).

312. *Id.*, § 8(b).

313. *Id.*, §§ 7(b), 9(d), 11(d).

314. CEQ, *Memorandum to the Heads of all Federal Agencies. Assuring Public Availability of Environmental Impact Statements under NEPA* (May 15, 1973), reprinted in 3:5 *102 Monitor* (1973).

315. 38 *Fed. Reg.* 10856–66, May 2, 1973.

316. See CEQ, *Third Annual Report* at 221 (1972).

317. For an illuminating discussion of these cases, see Arnold, Richard S., "The Substantive Quality under the National Environmental Policy Act," 3 ELR 50028 (1973).

318. 5 ERC 1001, 355 F. Supp. 280 (E.D. N. Car. 1973).

319. 3 ERC 1883, 3 ELR 20185 (E.D. N. Car. 1972).

320. 5 ERC at 1004.

321. 5 ERC 1033, 3 ELR 20248 (S.D. Tex. 1973).

322. *Id.*, at 1097.

323. *Id.*, at 1097–98.

324. *Id.*, at 1096.

325. EDF v. Corps of Engineers. 2 ELR 20740, 4 ERC 1721 (8th Cir. 1972). *aff'd* 4 ERC 1097 (S.Ct.), *cert. denied*, No. 72–1169, 41 U.S.L.W. 3637 (June 4, 1973). (Previous opinions of the District Court are reported at 2 ERC 1260, 2 ELR 20353 (1972)).

326. 2 ERC at 1264.

327. 4 ERC at 1725.

328. EDF v. Froehlke, 3 ELR 20001, 4 ERC 1829 (8th Cir. 1972).

329. Conservation Council v. Froehlke, 473 F. 2d 664, 4 ERC 2039 (4th Cir. 1973).

330. *Id.*, at 2039–40, quoting EDF v. Froehlke, 2 ELR 20620, 4 ERC 1829, 1833 (8th Cir. 1972). A district court in the sixth circuit has also recently followed the lead of these circuit courts with respect to substantive review of the agency decision under NEPA. See EDF v. TVA, 3 ELR 20331, 5 ERC 1183 (E.D. Tenn. 1973).

331. EDF v. Froehlke, 3 ELR 20001, 20004, 4 ERC 1829, 1833 (8th Cir. 1972).

332. 5 ERC 1449 (S.Ct. 1973).

333. SCRAP v. U.S., 4 ERC 1312, 353 F. Supp. 317 (D.D.C. 1972).

334. 5 ERC 1449 (S.Ct. 1973).

335. Sierra Club v. Morton, 3 ERC 2039, 92 S.Ct. 1361 (S.Ct. 1972).
336. 5 ERC 1449 at 1455 (S.Ct. 1973).
337. 5 ERC at 1455.
338. 5 ERC 1418 (D.C. Cir. 1973).
339. Council on Environmental Quality, *Memorandum to Federal Agencies on Procedures for Improving Environmental Impact Statements* (May 16, 1972), reprinted in 3 BNA Env. Rep. 82, 87, quoted in SIPI v. AEC, 5 ERC at 1424 (emphasis added by court) (1973).
340. 5 ERC at 1424.
341. *Id.*, at 1427.
342. Comptroller General of the U.S., *Adequacy of Selected Environmental Statements Prepared under the National Environmental Policy Act of* 1969, Report No. B–170186, to the Subcommittee on Fisheries and Wildlife Conservation of the Committee on Merchant Marine and Fisheries, U.S. House of Representatives (Nov. 27, 1972).
343. Most of the material in this section is based on a study by Trzyna, *Environmental Impact Requirements in the States* (1973) [a report to EPA, Office of Research and Monitoring].
344. California, Connecticut, Hawaii, Indiana, Maryland, Massachusetts, Michigan, Minnesota, Montana. New Mexico, North Carolina, Texas, Virginia, Washington, and Wisconsin.
345. See note 237, *supra.*
346. See Curruth, "The 'Legal Explosion' Has Left Business Shell-Shocked," 87(4) *Fortune,* 65 (1973).

CHAPTER 6

# Environmental Status and Trends

A primary aim of the Council is to encourage the development of a better system to measure the condition of the environment and to tell whether particular facets of environmental quality are improving or deteriorating. Such a system would improve the formulation and execution of environmental policy. The establishment of priorities, the provision of information to decisionmakers and the general public, and the evaluation of ongoing programs all would be greatly aided if more relevant data on environmental conditions were available and if greater use were made of environmental indices to summarize the diverse data.

## Use of Environmental Indices

Last year's Annual Report explained the need for environmental indices and discussed the Council's efforts to develop them for several aspects of the environment. While the Council has continued to work on these problems, several states and localities have begun to use indices in their own environmental programs.

San Diego County has received a large grant from the Ford Foundation for an integrated regional environmental management program. Development of a set of environmental indices is a central part of the program, and the first environmental quality indices for San Diego County will be published this summer.

In North Carolina, a Council on State Goals and Policy, composed of 14 citizens from across the State and chaired by the Governor, was established in 1971. One of its first tasks was to develop a set of environmental indicators. Some of these indicators will be published in a brochure intended for use by both the general public and decisionmakers.

A recent article in *The New York Times* reported that an increasing number of business firms are using environmental and other social indicators.[1] The article concluded that "The trend toward this type of social measurement and reporting seems certain to accelerate." A good example of the use of such measures is the "Social–Environmental Audit" in the 1972 Annual Report of the First National Bank of Minneapolis. The report states that "In spite of the difficulties encountered in data development, the audit has met with impressive community-wide support and cooperation . . . . The next step in the audit is to use it to determine which community problems are priority needs that the Bank should be addressing."

Obtaining adequate data is difficult for almost all organizations trying to compute environmental indices. To ease this problem, CEQ has recently published a *Federal Environmental Monitoring Directory*, listing a variety of sources within the Federal Government from which data about the environment may be obtained.[2]

The major Federal environmental agencies are addressing the difficult and time-consuming task of integrating environmental data systems. The Department of the Interior has done considerable developmental work on the RALI (Resources and Land Information) System, which is intended to serve as a reference system for indexing available data on land and natural resources. The National Oceanic and Atmospheric Administration in the Department of Commerce has been designing and building the Environmental Data Index (ENDEX) system for the last several years. When fully operational (target date, 1978), ENDEX will provide convenient, rapid referral to existing national and global data on oceans and the atmosphere. It will also document the quality, quantity, and character of the data. The Environmental Protection Agency is working to improve its STORET (Storage and Retrieval) system for water quality data and the SAROAD (Storage and Retrieval of Aerometric Data) system for air quality data and is also taking steps to integrate its other data systems.

The Oak Ridge National Laboratory of the Atomic Energy Commission, with the support of the National Science Foundation, operates the Environmental Information System consisting of a group of linked information centers. These centers store ecological data on the movement, cycling, and concentration of elements, isotopes, natural compounds, and pollutants in different ecosystems; data from the International Biological Program; mutagenesis caused by pollutants from various sources; and the nature and effect of toxic materials. The Laboratory is also developing a series of specialized data bases as part of the system. They will include such diverse areas as solid waste management data, census data, information on energy problems, and mathematical models for simulation of regional problems. The system has about 70,000 entries in the individual data bases and can also draw on 1 million references from other government agencies through its computer dial-up capabilities.

Although the Council's work on indices over the past year has focused mainly on land use, we are continuing to try to improve the analysis of air and water pollution data. The results of these efforts are described in the following sections.

## Air Pollution*

Air pollution monitoring is beset with many difficulties. But air quality is still the aspect of the environment which lends itself most readily to a set of national indicators. The data in this section deal with three aspects of the air pollution problem: emissions—the amount of pollutants released from sources such as smokestacks and tailpipes; ambient air quality—the concentration of pollution in the air that people breathe; and global trends in air quality. The Council's further efforts to develop air pollution indices also will be discussed. The data generally show a continued improvement in the quality of the Nation's air.

### Air Pollution Emissions

Table 1 shows estimated emissions of the five most pervasive air pollutants by weight for 1971, the latest full year for which information is now available. The data are based on a combination of measurements and calculations made by Federal air pollution officials, not on actual emission measurements. The results of the calculations are encouraging even though small year-to-year changes cannot definitively be attributed to improved pollution controls. Also, it should be kept in mind that nationwide emissions are a very poor indicator of the actual status of *air quality* because air quality depends as much on where the emission sources are located as on how much pollution is being emitted.

Of the five pollutants measured, between 1970 and 1971 there was an increase in one (particulates), a decline in three, and no change in one (nitrogen oxides), although the statistical significance of these changes is not known. The rise in particulates is due entirely to an increase in the size and number of forest fires, which are reported under the miscellaneous category. Forest fires also caused an increase in carbon monoxide, but total CO declined because of decreases in the transportation (primarily automobiles) and solid waste categories.

---

* Throughout this section, the following abbreviations are used: CO=carbon monoxide; $SO_x$=sulfur oxides; $SO_2$=sulfur dioxide; HC=hydrocarbons; $NO_x$=nitrogen oxides; TSP=total suspended particulates.

**Table 1**

### Estimated Emissions of Air Pollutants, by Weight Nationwide 1971 [1] [2]

[In million tons per year]

| Source | CO | Particulates | $SO_2$ | HC | $NO_x$ |
|---|---|---|---|---|---|
| Transportation | 77.5 | 1.0 | 1.0 | 14.7 | 11.2 |
| Fuel combustion in stationary sources | 1.0 | 6.5 | 26.3 | .3 | 10.2 |
| Industrial processes | 11.4 | 13.6 | 5.1 | 5.6 | .2 |
| Solid waste disposal | 3.8 | .7 | .1 | 1.0 | .2 |
| Miscellaneous | 6.5 | 5.2 | .1 | 5.0 | .2 |
| **Total** | **100.2** | **27.0** | **32.6** | **26.6** | **22.0** |
| Percent change 1970 to 1971[1] | −.5 | +5.9 | −2.4 | −2.6 | 0 |

[1] Figures for 1971 are not comparable to those for 1970 published in last year's report because of changed methods of calculation. Percent change 1970 to 1971 was calculated using 1970 figures computed on the 1971 basis. The most significant difference from the calculations used last year was the use of automobile emission factors based on the 1975 federal test procedures, as opposed to the previously used 1972 test procedures. The new method results in much lower estimates of automobile emissions.

[2] The table does not include data on photochemical oxidants because they are secondary pollutants formed by the action of sunlight on nitrogen oxides and hydrocarbons and thus are not emitted from sources on the ground.

Source: Environmental Protection Agency

Emissions from combustion of solid waste showed a marked decline of particulates, CO, and hydrocarbons, in part because many open dumps were closed under EPA's "Mission 5000" program and related state and local efforts. Combustion (mostly emissions from powerplants) showed slight declines in particulates, $SO_2$, and $NO_x$, but CO and HC emissions remained the same. The industrial process category showed a decline in $SO_2$ emissions and a very slight increase (0.1 million tons) in hydrocarbons. $NO_x$, particulates, and CO remained the same.

Transportation pollution, which consists predominantly of automobile emissions, showed a drop in HC (from 15.2 to 14.7 million tons) and CO (from 78.1 to 77.5 million tons). $NO_x$ emissions rose slightly (from 11.0 to 11.2 million tons). HC and CO emissions from automobiles declined, largely because post-1967 model-year cars, with their more stringent emission controls, replaced earlier-year models which had no pollution control modifications. However, if the number of automobiles on the road continues to increase, the downward trend in total emissions will at some point be reversed.

This pattern, as well as the impact of the more stringent standards recently mandated by EPA under the Clean Air Act Amendments (see the discussion in Chapter 5), is shown in Figures 1 and 2. It should be kept in mind that these two figures are projections, and like all projections, they are based on certain assumptions which may or may not materialize.

The data in Table 1 are national figures, but the general trend toward lower emissions is also seen in those individual cities which have maintained records of emission sources and amounts. Figures 3 and 4, for instance, show the decline in particulate and sulfur dioxide emissions in Philadelphia. The absolute drop in emissions from industrial processes is particularly striking.

By mid-1973, EPA expects to improve the basis for determining nationwide emissions. Instead of relying on gross national estimates, it will utilize the National Emissions Data System, which will contain actual emissions data submitted by the states under the requirements of the Clean Air Act. This should significantly improve the accuracy of the data.

Even if accurate emissions data are available, it would be very misleading simply to add the emissions of various pollutants together to obtain an aggregate assessment of air pollution because of the marked difference in the effects of various pollutants. As we have pointed out in previous reports, 1 ton of sulfur dioxide is much more harmful than 1 ton of carbon monoxide, other things being equal.

The detectable threshold of harm for any pollutant depends on many factors, the more important of which are exposure, concentration, and the sensitivity of the receptor. For example, plants do not seem to be affected by carbon monoxide concentrations that are toxic to man. Very complex conceptual problems arise when one attempts to equate the presence of one or more pollutants with a corresponding quantitative estimate of resulting damage.

Generally accepted, comprehensive estimates of air pollution damage are not available. However, Professor Lyndon Babcock of the University of Illinois has been developing methods to take account of the differences in damage caused by various pollutants. The Babcock method is essentially based on weighting pollutant emissions in proportion to the EPA ambient standards to take account of the relative toxicity of the various pollutants.[3] It is a type of pollution index, although any general air pollution index should be based on air quality rather than emissions. (The Babcock method is also applicable to air quality data.) The Babcock figures are used in this section to show the importance of considering effects when examining emission data. A more general discussion of air pollution indices is included later in this chapter.

Professor Babcock's calculations for 1971 are shown in Figures 5 and 6, along with the unadjusted emission figures. As the graphs show, the Babcock method more than triples the importance of particulate emissions and doubles the significance of $SO_2$.

Figure 1

## Emissions of Hydrocarbons by Automobiles in Urban Areas

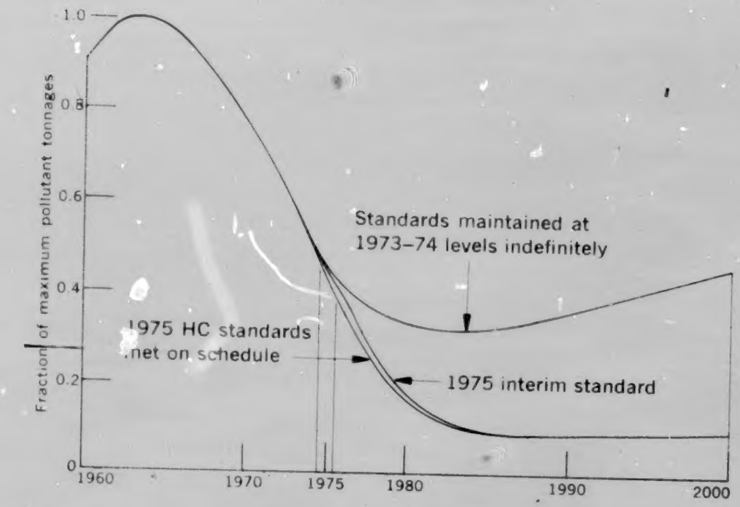
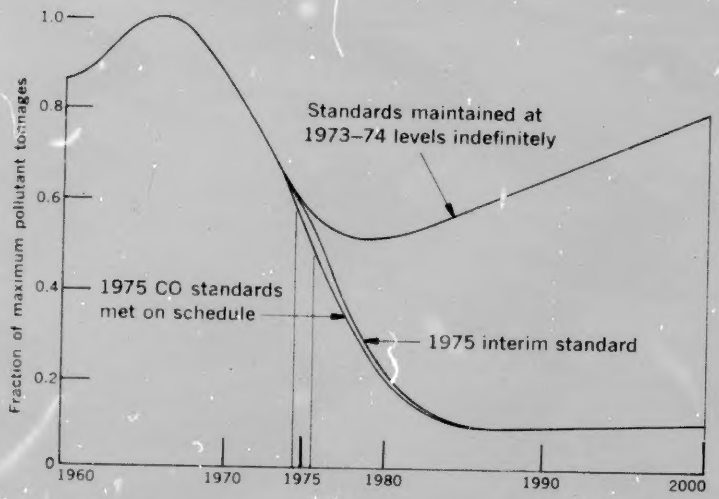


Figure 2

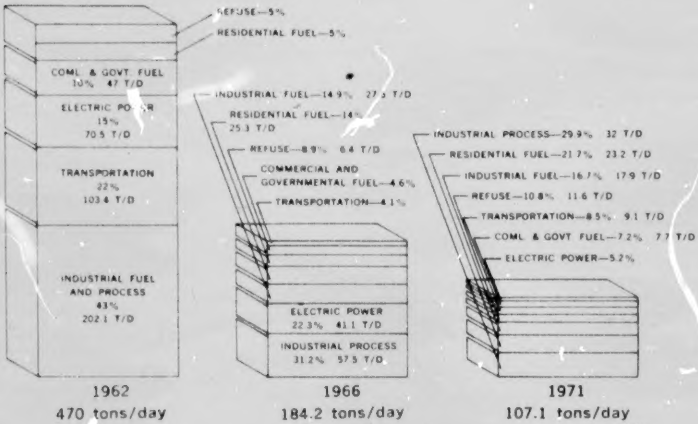
## Emissions of Carbon Monoxide by Automobiles in Urban Areas



Source: EPA press release, April 11, 1973

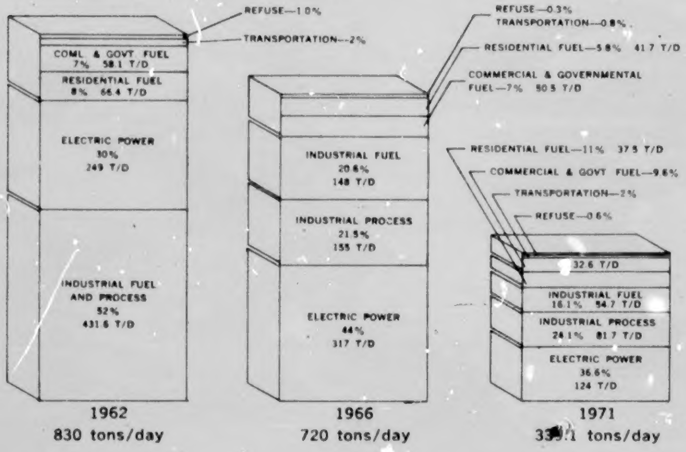
## Figure 3

## Emissions of Particulates in Philadelphia 1962–1971 [1]



## Figure 4

## Emissions of Sulfur Dioxide in Philadelphia 1962–1971 [1]



[1] Variations in emission inventory methods for the years listed make it inappropriate to draw fine-point distinctions.

Source: Philadelphia Department of Public Health, Air Management Services, Air Pollution Emission Data Summary

Figure 5

1971 Air Pollution Emissions, Percentage by Pollutant, Unadjusted and Adjusted for Effects

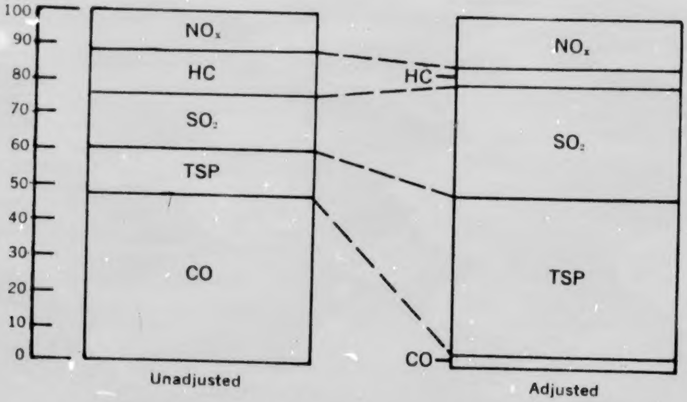
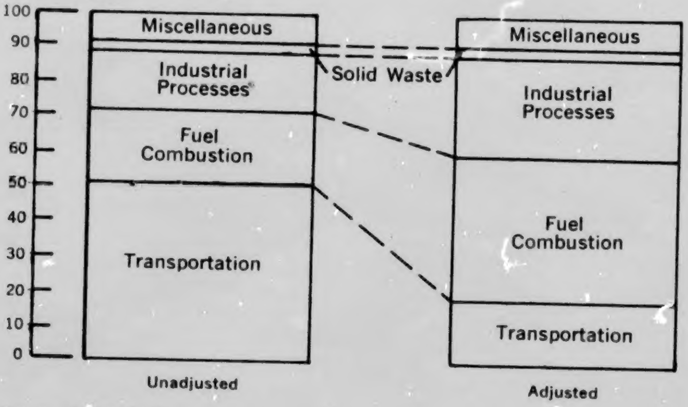


Figure 6

1971 Air Pollution Emissions, Percentage by Source, Unadjusted and Adjusted for Effects



Source: Appendix A

The Babcock method leaves a number of problems unsolved in trying to adjust air pollution measurements for their impact on health and welfare. For example, it shows that fuel combustion in stationary sources (such as powerplants and home heating) is the most significant pollution source; transportation sources become much less significant. But transportation sources are more likely to be concentrated in population centers than many other types of sources and thus will cause greater damage to human health than their weighted values would suggest. In addition, most particulates from transportation sources are very small, can be readily inhaled, and therefore pose a potentially greater threat to health than larger particulates. Only about one-third of the particulates from industrial sources are this small. Because it does not take these factors into account, Babcock's method probably underestimates the adverse impact of transportation sources. The method also suffers from most of the problems of other air pollution indices. These problems are discussed later in this section.

Further research and monitoring efforts are needed to give a more precise estimate of the significance of different pollution sources. Given the many uncertainties which now exist, it probably would be inappropriate at this time to use the Babcock method as a basis for making policy.

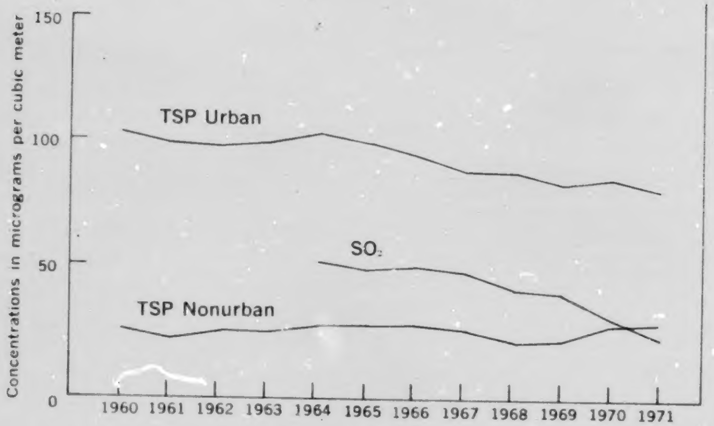
## Ambient Air Quality

The 1971 and 1972 data for most air pollution monitoring sites show that the trend in air quality improvement, noted last year, has continued. As Figure 7 shows, the most dramatic improvement in recent years has been in ambient levels of sulfur dioxide, one of the most hazardous air pollutants. The decline in $SO_2$ has resulted primarily from state and local regulations restricting the sulfur content of fuels. Levels of suspended particulates have also decreased significantly in urban areas, probably because of the installation of pollution control devices such as scrubbers and precipitators. In remote, nonurban areas, the particulate levels have remained about the same for the past 10 years.

The trend toward improved air quality is also evident in data for the Nation's largest cities. Table 2 shows the ratio of the annual average air quality to the EPA annual primary standards for selected cities. The primary standard is the level of the particular pollutant below which, based on current information, human health is believed to be adequately protected. Because the numbers in the table are the ratio to the primary standard, they can also be read as the percentage of the standard. Thus a ratio of 1.50 would mean that a city was 50 percent above the standard for a given year, a ratio of 1 would mean that the standard was just being met, and a ratio of 0.25 would mean that levels were only 25 percent of the primary standard.

**Figure 7**

**Trends in Ambient Levels of TSP and $SO_2$**



Source: Environmental Protection Agency

Of the 10 cities in Table 2, 6 have shown a general trend toward improved levels of particulates, and 7 have shown a similar improving trend for sulfur dioxide. As noted above, these improvements are due to the use of less polluting fuels and the installation of control devices.

EPA has collected data in five cities on the automobile-related pollutants—carbon monoxide, nitrogen oxides, and photochemical oxidants.[4] An analysis of the trends in these cities shows that average CO concentrations decreased between 1962 and 1971. However, changes in CO instrumentation and operating procedures have probably exaggerated this pattern. No trend was evident for oxidants. $NO_x$ concentrations increased over the 10-year period, but it should be pointed out that at present there is no standard method for measuring $NO_x$. The standard method which was being used, the Jacobs-Hochheiser procedure, has been found to overestimate the amount of $NO_x$ in the air.[5] However, $NO_x$ remains a significant pollutant, in part because of its contribution to the formation of photochemical oxidants, the substances which are the primary constituent of smog like that in Los Angeles and which are also the most important pollutants affecting vegetation.

Some caution must be used in interpreting the data shown in Table 2. They are based on only one monitoring site in each city, usually a site located in the central business district. Because industry and automobile traffic may be increasing more rapidly in the outlying areas of the city than in the downtown area, air pollution

Table 2

## Air Quality Data for Selected Cities, Ratio of Annual Mean to EPA Primary Standards

| Pollutant | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 |
|---|---|---|---|---|---|---|
| LOS ANGELES | | | | | | |
| $SO_2$ | | | | [1]0.14 | 0.26 | 0.30 |
| TSP | 1.22 | 1.72 | 1.24 | 1.67 | 1.77 | 1.57 |
| DENVER | | | | | | |
| $SO_2$ | | | .22 | .17 | .10 | .09 |
| TSP | 1.24 | 1.42 | 1.51 | 1.63 | 1.57 | 2.03 |
| WASHINGTON, D.C. | | | | | | |
| $SO_2$ | | | .36 | [1].34 | [1].26 | .50 |
| TSP | 1.13 | 1.14 | .98 | [1]1.01 | .97 | 1.11 |
| CHICAGO | | | | | | |
| $SO_2$ | | 2.18 | 2.30 | 1.50 | .91 | .59 |
| TSP | | 1.49 | 1.80 | 1.49 | 1.53 | 1.30 |
| BOSTON | | | | | | |
| $SO_2$ | [1].23 | .65 | [1].80 | [1].59 | [1].22 | .16 |
| TSP | | 1.23 | 1.14 | [1]1.07 | [1]1.13 | 1.07 |
| ST. LOUIS | | | | | | |
| $SO_2$ | 1.04 | 1.14 | .91 | [1].72 | .12 | .24 |
| TSP | 1.49 | | 2.48 | [1]2.04 | 1.17 | 1.24 |
| CINCINNATI | | | | | | |
| $SO_2$ | | .36 | .33 | .14 | .21 | .29 |
| TSP | 1.48 | 1.32 | 1.39 | 1.34 | 1.29 | 1.16 |
| PHILADELPHIA | | | | | | |
| $SO_2$ | | 1.13 | .87 | 1.06 | [1].46 | .56 |
| TSP | 2.00 | 1.49 | 1.69 | 1.80 | 1.33 | 1.03 |
| PITTSBURGH | | | | | | |
| $SO_2$ | .89 | .94 | .95 | .72 | .62 | .79 |
| TSP | 1.78 | 2.15 | 1.92 | 1.69 | [1]1.48 | 1.80 |
| NEW YORK CITY | | | | | | |
| $SO_2$ | 4.35 | [1]3.03 | [1]1.69 | [1].91 | [1].87 | .60 |
| TSP | 2.18 | | 1.41 | 1.64 | [1]1.41 | 1.27 |

[1] These readings do not meet EPA criteria for statistical validity, in most cases because an insufficient number of samples was collected during the year.

Source: Based on EPA data from the National Air Sampling Network may be growing worse in large parts of the metropolitan area while getting better downtown. Conversely, because the site is located in the central business district, which is usually more polluted, these data probably overstate the levels of some pollutants for the area as a whole. Further, the data do not separately consider meteorological factors such as the number of inversions, average temperature, or amount of rainfall during the year. Small year-to-year fluctuations may be due as much to these factors as to control measures. However, the general trends over the past 3 to 6 years support the proposition that air quality in the central business districts of large urban areas (which have had the worst problems) is improving.

Although there have been significant improvements in air quality, a massive effort is still needed to meet EPA standards. As Table 3 shows, many areas of the country have ambient levels which exceed the primary standards. The priority rankings in the table were assigned in 1971 by EPA to the 247 air quality control regions (encompassing all of the United States) to aid in the formulation of state implementation plans under the Clean Air Act. The priorities were assigned on the basis of monitoring data when such data were available. In many cases, population of the area and other factors were used because there were not sufficient data to assign a priority.

Based on the priority ranking data, 108 of the 247 air quality control regions did not clearly violate any of the primary EPA

**Table 3**

**Number of Air Quality Control Regions by Priority Ranking for Major Pollutants 1971**

| Priority | Particulates | SO$_2$ | NO$_2$ | CO | Oxidants |
|---|---|---|---|---|---|
| I (Levels violate primary standards) | 120 | 60 | [1] (47) | 29 | 53 |
| II (Levels at or around primary standards) | 70 | 41 | [2] | [2] | [2] |
| III (Levels better than primary standards) | 57 | 146 | [1] (200) | 218 | 194 |

[1] EPA has now determined that NO$_2$ is a significant problem only in Chicago and Los Angeles. The previous priority rankings were based on an erroneous method of measurement (see text). Statement by William D. Ruckelshaus before the Subcommittee on Air and Water Pollution, Committee on Public Works, U.S. Senate, April 17, 1973.

[2] Because of a lack of data, priorities for NO$_2$, CO, and oxidants were given either a 1 or a 3; the 2 rating was not used.

Source: Based on EPA data

standards; 51 were in violation of the standards for only one pollutant; 43 were violating standards for two pollutants; 22 were violating standards for three pollutants; 9 were violating standards for four pollutants; and 14 had significant problems with all five pollutants. As Table 3 shows, the most frequent problem was the standard for particulates. However, meeting the standards for the automobile-related pollutants—$NO_2$, CO, and oxidants—may prove the most difficult problem.

The priority ranking of air quality control regions indicates that many more areas violate the standards than may be inferred from the data on individual cities. The differences between the two sets of data are due to the limitations of each: the ambient data are based on only one station in each city, whereas the control region ranking is based on a variety of factors, including both emission and ambient data. Further, many of the Priority I regions are listed as violating the standards only because of one or two major sources within the region. This is the case with 21 of the 60 regions shown in Table 3 as Priority I for sulfur dioxide. The data on individual cities do not accurately indicate the nature of the $SO_x$ problem because they are based on annual average levels of pollution, whereas the most common problem is violation of the 24-hour $SO_x$ standard, not the annual standard.

## Air Quality Indices

Last year's report stressed the utility and importance of developing environmental indices and used three types of air quality indices: the Mitre Air Quality Index, the Extreme Value Index (also developed by Mitre), and the Oak Ridge Air Quality Index. All share at least four shortcomings: first, they do not adjust for the number of people exposed to given levels of air pollution. That is, they are indices of pollutant levels, not of the extent of population exposure. Second, they do not distinguish between changes in air quality due to control measures and changes due to natural meteorological fluctuations such as amount of rain or number of inversions during the year. Third, they do not take account of interaction among different pollutants. Fourth, all the indices are based on a direct linear ratio between the ambient levels and a given standard, even though the relationship between pollutant levels and the damage caused is, in many cases, nonlinear.

An adjustment of an index for the number of people exposed can be incorporated simply by multiplying the index value for a given area by the proportion of the total population living in that area. Insofar as the index is based on monitoring data from just one site in a large city, this population-weighting approach may severely distort the results because many people in the city will not in fact be exposed to the air pollution levels found at the monitoring site. However, even worse distortions result from giving all monitoring sites equal weight whether they are located in big cities or small towns. Thus, use of a population-weighting factor is desirable. As the number of monitoring sites grows, the population-weighting factor allows for them to be readily added to the overall index.

Regarding the second problem, research is now underway in EPA and the National Oceanic and Atmospheric Administration to develop techniques to separate the effects of meteorology on air quality readings from the effects of changed levels of emissions. At present there are no accepted methods for distinguishing between the two.

There is good evidence to indicate that the damage caused by certain combinations of pollutants is greater than the sum of the damage caused by equal amounts of the same pollutants acting independently. For example, 1 part per million of $SO_2$ probably is more damaging to health when there is a high level of particulate matter than when there is a low particulate level. Neither the indices nor the EPA standards deal with this synergistic effect, primarily because little is known about the quantitative interrelationships among the pollutants. There are similar problems in dealing with the damage caused by short exposure to high levels of a pollutant as contrasted with long-term exposure to low pollutant levels.

The fourth problem is complex, but it is critical to the formulation of air quality indices. Two steps are necessary to compile an index. First, the values for each pollutant must be translated into a common unit of measurement (such as a percentage); that is, they must be converted to a number which does not relate only to that pollutant. This is necessary so that the values for different pollutants can be combined into one index. Second, the values for each pollutant must be "weighted" so that the differences in damage (i.e., health effects, plant destruction, corrosion of materials, etc ) caused by an equal amount of two different pollutants can be reflected in the index. In other words, the index should reflect the damage caused by the pollutants and not just the amount of pollutants in the air.

The indices used last year accomplished both of the above steps by dividing each of the pollutant concentration values by the EPA standards for that pollutant. This produced a series of values which had a straight-line relationship to the standard. However, the damage caused by many pollutants is not directly proportional to the standard. When plotted on a graph, the relationship is more likely to be some type of curve than a straight line. Ideally, the weighting of the values of a pollutant would be based on a damage curve rather than just on the relationship to the standard. It would be necessary to use different curves for the different pollutants, and it might also be necessary to use two different curves for the same pollutant—one for short-term and one for long-term exposure.

There seems to be general agreement that using damage curves is, in theory, preferable to using the standard. The standard has been used because there also seems to be general agreement that there is not enough scientific knowledge from which to develop accurate damage curves. However, we are inclined to adopt the damage curve approach on the grounds that even an approximate curve comes closer to reflecting the damage caused by a pollutant than does the straight-line approach. Moreover, the use of a curve, unlike the use of a straight line, allows for continuing improvement in the accuracy of the damage estimates and, thus, of the indices.

During the coming months, the Council will be working on the development of acceptable damage curves and on incorporating other improvements into an air pollution index. We hope by next year to test this revised index with actual pollution data.

## Global Trends

Some of the most important potential air pollution problems are global in scope and may become apparent only after a long period of time. The need to measure worldwide trends in environmental quality over a long time scale was clearly set out in the Earthwatch program approved by the U.N. Conference on the Human Environment.

The United States has responded to this need to measure global phenomena in several ways. The Environmental Protection Agency and the National Oceanic and Atmospheric Administration (NOAA) have established 10 "regional" stations to measure atmospheric turbidity and to collect and analyze precipitation for trace elements. These stations are a part of the World Meteorological Organization global network. In 1972 the United States established two additional "clean" air observing programs—an observatory at Point Barrow in Alaska and a preliminary sampling program at Cape Matutula in American Samoa. These locations greatly extend the scope of the efforts now underway at Mauna Loa, Hawaii, and at the South Pole. However, Mauna Loa still remains the key location because of its longer history.

The most notable example of a potential global air pollution problem is the concentration of carbon dioxide ($CO_2$) in the atmosphere. $CO_2$ is not a pollutant in the sense that it does not directly harm organisms, but a significant increase in the proportion of $CO_2$ in the atmosphere could create a warmer global climate because $CO_2$ traps radiant heat from the earth within the lower atmosphere, preventing its release to the upper atmosphere. It has been speculated that sufficient warming might melt the polar ice caps and raise the ocean levels significantly. Several scientists have speculated that if carbon dioxide in the atmosphere and oceans continues to increase rapidly during the next century, the resulting acidification of the oceans will decrease their ability to absorb fossil fuel carbon dioxide. This will cause an even faster carbon dioxide accumulation in the air and potentially greater "greenhouse" warming of the lower atmosphere.

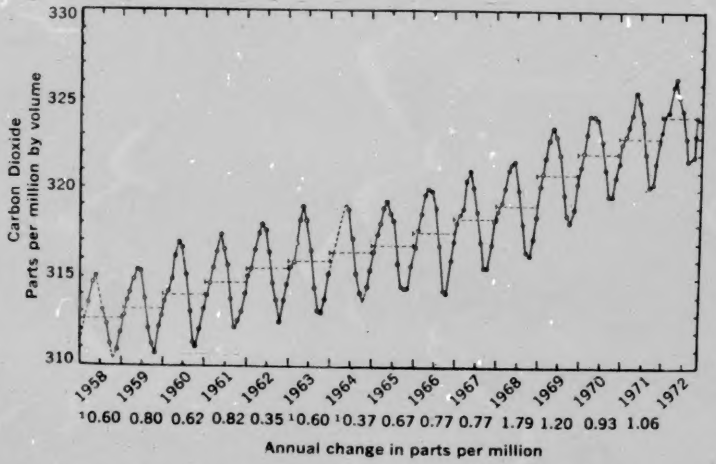
Carbon dioxide concentrations at baseline monitoring stations over the globe have grown faster since about 1968 than in the previous decade. This is illustrated in Figure 8, which traces $CO_2$ concentrations at the NOAA Baseline Station on Mauna Loa. The seasonal variation in the figure is due to the biospheric cycle—the uptake of carbon dioxide through photosynthesis in the summer season and release of carbon dioxide through decay and respiration at other times. The numbers along the bottom of the chart indicate the changes between successive years. Note the larger values after 1968.

The amount of carbon dioxide released to the atmosphere has risen at about 4¾ percent per year from 1960 to 1971.[6] This growth is ascribed to global combustion of fossil fuel. The fraction of carbon dioxide remaining airborne, as measured at Mauna Loa, appears to have increased from 45-50 percent of $CO_2$ emitted in 1958–68 to over 60 percent in the more recent period 1968–72. The actual concentrations are shown in Figure 8. There is no evident explanation for this change.

The growth in carbon dioxide may be contrasted to what happened following the eruption of Mt. Agung in early 1963 (see Figure 9). A huge dust pall from the eruption sharply reduced the level of solar radiation, which is basically the amount of sunlight getting through

**Figure 8**

**Increase in Carbon Dioxide Concentrations at Mauna Loa Observatory**

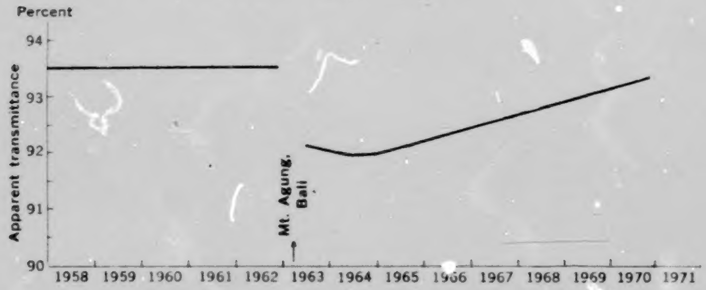


[1] Change based on less than 12 monthly measurements per year.

Source: Department of Commerce, National Oceanic and Atmospheric Administration, based on data provided by C. D. Keeting, Scripps Institution of Oceanography, sponsored by the National Science Foundation

Figure 9

Transmittal of Normal Incidence Solar Radiation at Mauna Loa



Source: H. T. Ellis, and R. F. Pueschel, "Solar Radiation, Absence of Air Pollution Trends at Mauna Loa, Science 172: 845–46; November 1970 to September 1971, unpublished NOAA data

the atmosphere to the earth's surface. As the dust gradually settled and dissipated, the level returned to normal.

The Mauna Loa solar radiation data illustrate not only the tremendous impact that natural events can have on environmental conditions but also the ability of the natural system to recover from temporary stresses. The carbon dioxide problem shows the impact that man's activities can have on natural systems.

## Water Pollution

Many more data have been collected on water pollution than on air pollution. But most of the water data are collected for specific state or local needs, such as enforcement of water pollution laws, not for determining national trends in water quality. The large number of water pollutants and the multiple uses served by water (swimming, drinking, fish and wildlife, etc.) also make it difficult to describe and summarize water quality trends. The levels of a pollutant cannot be compared to a single standard because the standards vary according to the use for which the water is desired.

This section will first discuss water pollution effluents. (The term effluents in water pollution, which is equivalent to the term emissions in air pollution, means the pollutants discharged from a pollution source, such as a factory or municipal waste treatment plant, into a water body.) The section then turns to data on water quality. Following that, trends in pollution of the Great Lakes will be briefly described. Finally, other activities directed at establishing trends in water pollution are noted.

### Water Pollution Effluents

The Federal Water Pollution Control Act Amendments of 1972 prohibit all municipal, industrial, and other "point source" water pollution dischargers from discharging into navigable waters without a permit. One condition of each permit is that the discharger report periodically on the nature and amount of pollutants being discharged. Once the permit system is fully operational, it should provide a comprehensive picture of the pollution coming from point sources as well as a vital tool for reducing such pollution.

Some data on industrial effluents are already available from permits filed under the 1899 Refuse Act, the precursor of the new permit program. Table 4 shows these data for EPA's Region IV, which covers the States of Kentucky, Tennessee, North and South Carolina, Mississippi, Alabama, Georgia, and Florida. This region was selected because the permit applications in EPA's possession are believed to cover approximately 90 percent of the industrial dischargers in the region. The table shows only those types of industries which are major polluters. The data are not definitive or exhaustive because a few sources within these industrial classifications may not have been included. Further, the accuracy of all the permit applications has not been checked. There are also problems arising from the way in which the information is recorded. For instance, when a particular plant falls under more than one industrial code, its effluents are counted twice in the industry classification part of the table. This problem has been eliminated in the total figures.

Table 4 indicates that the paper industry accounts for more than one-half of the industrial BOD (biochemical oxygen demand) discharged in Region IV. Manufacturers of chemical and allied products are the largest dischargers of nitrates, heavy metals, and solids. The extremely large amount of solids reportedly discharged is somewhat misleading because although the intake water often contains a high concentration of solids, the computer system reports only effluents. For example, if the intake water contains 100,000 pounds of solids and the particular plant adds 5,000 pounds of solids to this water during processing, the reported discharge will be 105,000 pounds. With the new reporting system being implemented by EPA, this kind of exaggeration will be reduced. The net increase, as well as the absolute discharge, will be shown.

An analysis of the individual dischargers in Region IV shows not only that the major portion of the industrial water pollution problem is concentrated in a few industries but that it is concentrated in a few large plants. Figure 10 shows the distribution of the number of plants according to the amount of BOD that they discharge. The vast majority of facilities are comparatively small dischargers. Of 1,920 facilities reporting BOD discharges, the 5 largest account for 35 percent of the total; the next 5 account for another

**Table 4**

## Industrial Effluents, EPA Region IV

[In pounds per day]

| SIC code[1] | BOD[2] | Total phosphorous[3] | Nitrate[4] | Total heavy metals[5] | Total solids |
|---|---|---|---|---|---|
| 20—Food and kindred products | 226,118 | 4,593 | 2,722 | 6,802 | 1,877,297 |
| 22—Textile and mill products | 293,159 | 39,504 | 23,347 | 21,828 | 3,000,175 |
| 26—Paper and allied products | 2,835,019 | 18,677 | 21,202 | 25,673 | 48,776,871 |
| 28—Chemical and allied products | 933,316 | 74,063 | 70,961 | 145,934 | 83,795,063 |
| 32—Stone, clay, and glass | 15,077 | 684 | 1,238 | 10,482 | 2,715,498 |
| 33—Primary metal industries | 65,524 | 2,115 | 5,241 | 12,496 | 2,268,854 |
| 347—Coating, engraving, and allied services | 3,335 | 1,395 | 788 | 3,830 | 477 |
| 35—Machinery | 771 | 1,236 | 1,032 | 1,766 | 26,663 |
| 37—Transportation equipment | 3,951 | 3,015 | 668 | 206 | 70,707 |
| **Total for these SIC codes[6]** | **4,210,567** | **143,494** | **121,243** | **221,384** | **131,020,201** |
| **Total for all permit applications in Region IV** | **4,777,222** | **1,013,680** | **208,951** | **821,292** | **1,234,551,055** |

[1] Standard Industrial Classification Code, as defined by the Department of Commerce.

[2] Biochemical oxygen demand.

[3] As P.

[4] As $NO_3$.

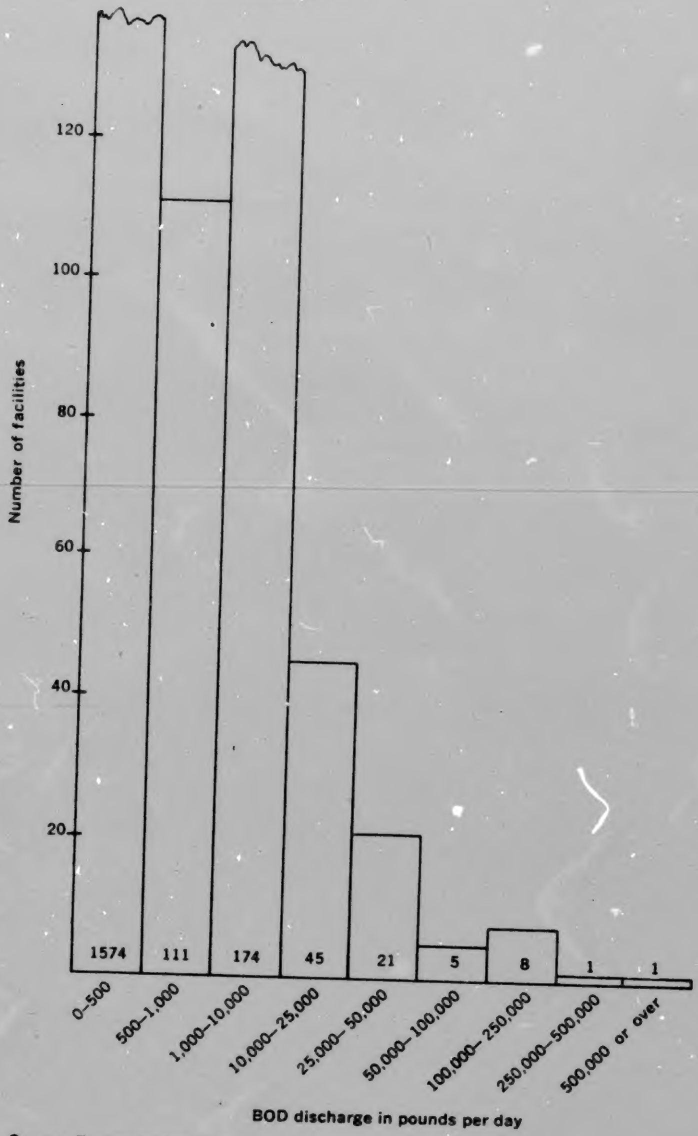
Source: Environmental Protection Agency

[5] Includes antimony, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, silver, thallium, tin, and zinc.

[6] Totals are less than sum of the columns because of elimination of double-counting (see text).

Figure 10

Number of Facilities by Amount of BOD Discharged, EPA Region IV



Source: Environmental Protection Agency

12 percent. One percent of all the facilities accounts for more than 50 percent of the total BOD discharged.

The permit program covers only point sources of water pollution. However, it should be kept in mind that nonpoint sources contribute significant amounts of pollution, such as pesticide and fertilizer runoff from cropland and sediment from a variety of sources. The sediment problem is discussed later in this chapter, and last year's Annual Report contained some analysis of nonpoint effluents, but there is little quantitative information on water pollution from nonpoint sources.

## Water Quality

**National Stream Quality Accounting Network**—The Department of the Interior's Geological Survey (USGS) has established a National Stream Quality Accounting Network for periodic assessment of stream quality based on continuing measurements. The Network monitoring sites are selected to give a representative picture of water quality in the United States and are located whenever possible at the point where a stream drains 1 of the 320 designated "water accounting units" into which the Nation has been divided.

It would be prohibitively costly and perhaps technically impossible to have enough sites to measure water quality conditions in every mile of every major stream. The rationale for the USGS network allows for a limited number of stations to be used to summarize national water quality conditions. The data collected at each of the sites can also be considered to represent stream quality conditions in terms of the measured constituents for the accounting unit where the site is located. Obviously, however, conditions within the unit may vary greatly from those at the monitoring site.

Some data are already available at over 70 percent of the 525 sites included in the Network. During fiscal year 1973, supplementary funding has allowed 50 of the designated sites to become fully operational, measuring all of the specified constituents at the frequency prescribed by the initial Network design.

The USGS has examined data collected prior to activation of the Network for evidence of water quality trends.[7] The USGS study included an analysis of historical data available for 88 existing Network sites. They are unevenly distributed across the Nation because their selection was governed primarily by the availability of data over a number of years. The data were often sparse and highly variable, limiting the trend evaluation to analysis for specific conductance (or conductivity) and temperature.

The analysis was also limited to long-term trends because, statistically speaking, it is difficult to obtain valid time trends using data covering a period of only 2 or 3 years. The data were expressed in annual terms to take account of seasonal and within-year cyclical effects. Thus, only one measurement per year is available for statistical analysis. Given the effect of multiyear cycles (such as long-term regional temperature changes), the uncertainty of the measurement methods used,, and the possible margins of error in the statistical techniques applied to the data, two or three measurements are usually not sufficient to ascertain a trend. It is expected that many of the data problems encountered in he USGS assessment will be overcome after the Network has been operational for a few years.

Specific conductance is a summary measure for a wide variety of major inorganic constituents in streamflow, including hardness, dissolved solids, and chloride concentrations. Using a method similar to that described in last year's Annual Report to adjust for variability in flow conditions,[8] USGS analyzed data from each of the 88 stations to see whether there was any significant change in conductance levels. Only 15 stations showed change over and above that caused by changes in flow conditions. Of these, 5 showed an improvement in water quality and 10 showed a deterioration.

The analysis of temperature showed 13 sites with significant changes in stream temperature: 10 showed a decrease in temperature; 3 showed an increase. In a majority of the cases, the temperature decreases could be attributed to dam construction and reservoir operations above the monitoring site. In some of the remaining cases, the decreases were apparently due to a change in the way that the measurements were taken, not to a change in actual stream conditions.

**EPA Studies of Water Status and Trends**—One of the most frequent problems in water monitoring to detect pollutants is that pollution conditions can be highly localized. Monitoring teams must often take many samples along a few miles of a river (and across its width, if it is large) to define the distribution of a pollutant. The Environmental Protection Agency, in contrast to USGS, is focusing its efforts on determining the impact of pollution sources.

EPA is now working on a plan to establish permanent monitoring sites at points upstream and downstream of areas with major sources of pollutant discharges. In this way, the river waters may be compared before and after they pass through zones receiving substantial discharges of pollutants.

EPA is also preparing a report, required under the Federal Water Pollution Control Act Amendments of 1972, on the status of water quality. It will be sent to the Congress in January 1975. EPA will try to use data from existing monitoring sites to pinpoint both local and widespread pollution concentrations in 10 to 20 of the major rivers of the United States. By noting where each station is and how far it is from large aggregations of pollution sources, the report will for the first time place pollution problems in perspective for some of these rivers.[9]

EPA has tested this technique on a short stretch of the Detroit River, where many water samples were taken regularly at 41 sites between 1967 and 1969. These are more data than are likely to be available on most rivers, because the Detroit River has been intensely monitored as part of a cooperative effort with Canada to control pollution entering Lake Erie. The data are obviously somewhat out of date, but they were used because the analytical technique could be readily applied. Although quite crude, the analysis shows that over the distance of just a few miles there can be large differences in pollution levels.

The major waste sources in the area studied are clustered along the banks of the Detroit River. They include steel and chemical manufacturers, a large municipal sewage discharge on the lower river, and a large number of combined sewer overflows from Detroit. Smaller concentrations of industrial and municipal discharges are spread throughout the seven small drainage areas in southeast Michigan: the Raisin, Huron, Rouge, Clinton, Belle, Pine, and Black Rivers. The main rivers, St. Clair and Detroit, are divided almost in half by the international boundary. Only stations in U.S. waters were analyzed because wastes discharged from the Detroit area tend to hug the U.S. shoreline of the rivers.

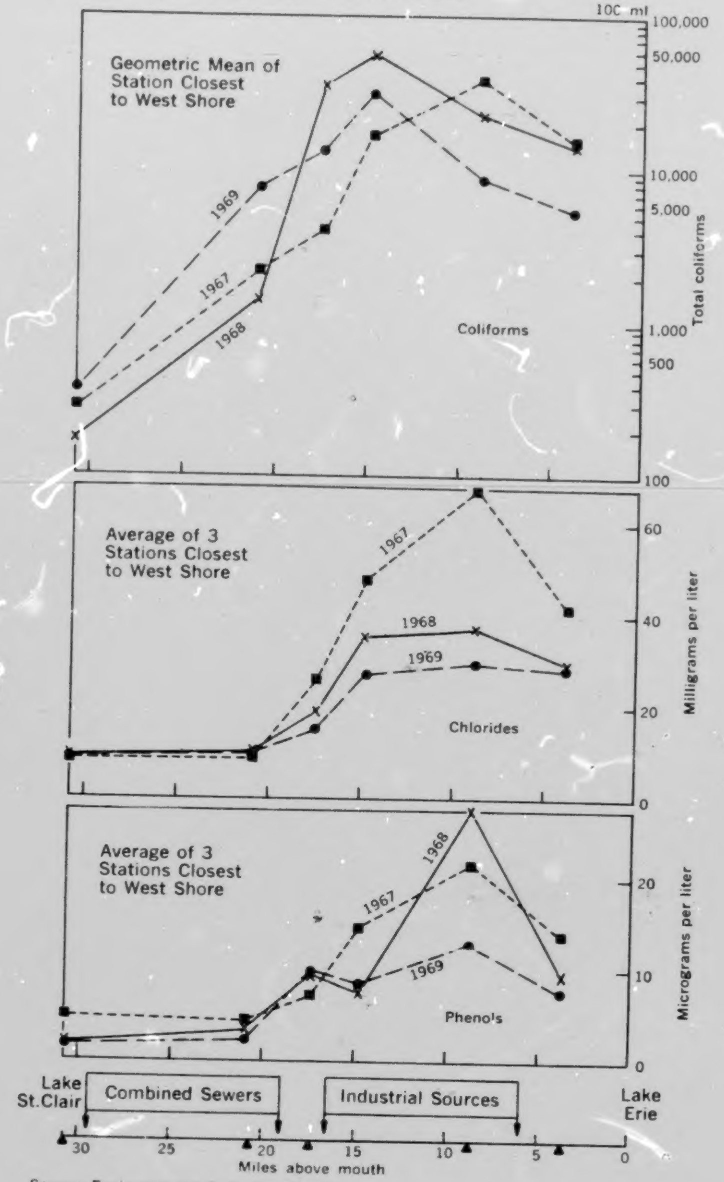
Figure 11 shows three measurements which illustrate the results: total coliform bacteria organisms per 100 milliliters (a measure of pollution from urban runoff and domestic wastes), chlorides, and phenols (components of industrial wastes in the area). The graphs depict annual mean measurements for stations close to the U.S. shore, arranged according to their distance upstream from the mouth of the river (at Lake Erie). They show that during the 1967–69 period:

- The river was relatively clean upstream of Detroit.
- Overflows from combined sewers caused the geometric mean coliform levels to exceed proposed EPA guidelines (10,000 per 100 milliliters) for about 10 to 15 miles downstream.
- Industrial sources caused elevated chloride and phenol concentrations in the lower river area.
- Although the year-to-year trends were somewhat mixed, the pollutant levels associated with industry were gradually lessening during the period, while municipal pollutant levels were generally worsening. Increases in phosphates and organic nitrogen (not shown) also reflected problems due to municipal wastes and nonpoint sources. These trends are consistent with EPA's findings that Detroit's industries were generally meeting abatement schedules while municipalities were lagging.[10] But these trends could be modified after year-to-year variations in temperature, rainfall, stream flow, or other conditions are taken into account.

This study demonstrates that although pollution problems may be widespread, local variations in pollutant levels make monitoring and the interpretation of water quality data a difficult and complex task.

Figure 11

## Detroit River, Annual Means for Coliforms, Chlorides, and Phenols



Source: Environmental Protection Agency

## Pollution in the Great Lakes [11]

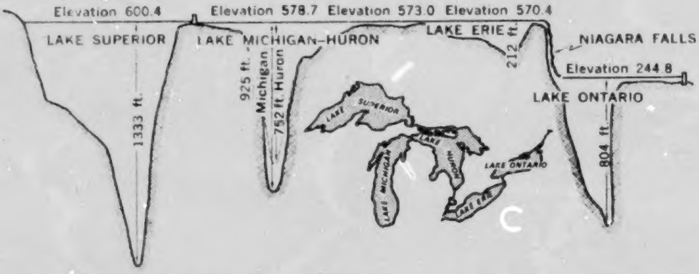
The Great Lakes and their connecting waters constitute the largest body of fresh water in the world. They are a natural resource of immense value to the United States and Canada. The Great Lakes Basin encompasses approximately 300,000 square miles of which nearly one-third, 95,000 square miles, is lake surface. Figure 12 shows the characteristics of each of the lakes.

Over 29 million Americans and Canadians currently live in the Great Lakes Basin. The population growth has been dramatic, rising from 2.3 million in 1860 to 29 million in 1970—a 1,160 percent increase in 110 years. The greatest growth has been in the basins of Lakes Erie and Michigan, which, together with Lake Ontario, have experienced the most severe pollution. At present growth rates, about 40 million people will live in the basin by the year 2000. By 2020 a megalopolis will stretch from Milwaukee to Montreal.

The waters of the Great Lakes are used for navigation, sport and commercial fisheries, recreation, wildlife, municipal and industrial

### Figure 12

### Characteristics of the Great Lakes [1]


Elevation 600.4
Elevation 578.7
Elevation 573.0
Elevation 570.4
LAKE SUPERIOR
LAKE MICHIGAN–HURON
LAKE ERIE
NIAGARA FALLS
Elevation 244.8
LAKE ONTARIO
1333 ft.
925 ft. Michigan
752 ft. Huron
212 ft.
804 ft.
LAKE SUPERIOR
LAKE HURON
LAKE MICHIGAN
LAKE ONTARIO
LAKE ERIE

[1] Scales have been distorted to convey visual impression of differences in elevation. Lake levels shown represent average annual elevation for the period 1860–1970.

PHYSICAL CHARACTERISTICS OF GREAT LAKES

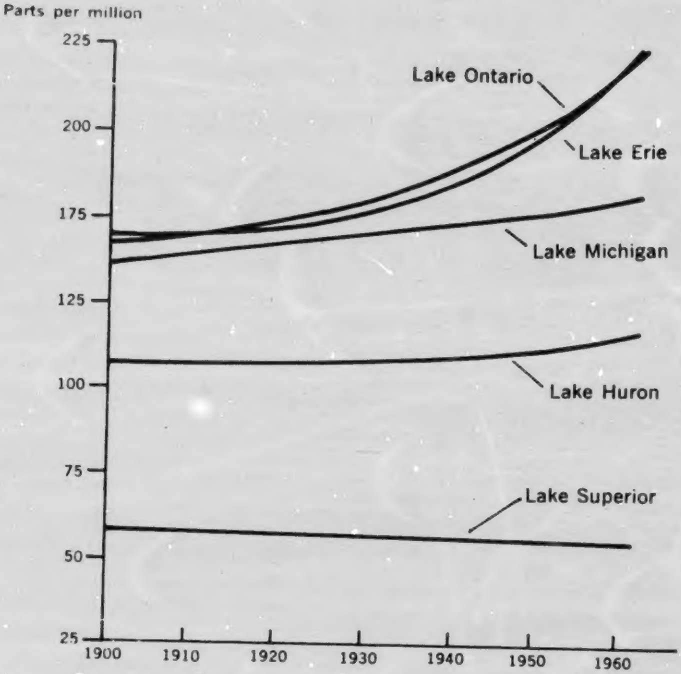
| | Superior | Huron | Michigan | Erie | Ontario |
|---|---|---|---|---|---|
| Surface Area (square miles) | 31,700 | 23,000 | 22,300 | 9,910 | 7,340 |
| Maximum Depth (feet) | 1,333 | 750 | 923 | 210 | 802 |
| Average Depth (feet) | 489 | 195 | 279 | [illegible] | 283 |
| Volume (cubic miles) | 2,935 | 849 | 1,180 | 116 | 393 |
| Population (millions) | .533 | 1.236 | 13.516 | 11.513 | 2.531 |
| Ratio of Population to Lake Volume | .18 | 1.45 | 11.45 | 99.25 | 6.49 |

Source: International Great Lakes Levels Board, *Interim Report to the International Joint Commission* (July 1968); Great Lakes Basin Commission water supply, hydroelectric power generation, and wastewater disposal. This latter use has markedly changed the original condition of the lakes' waters. The increasing concentrations of dissolved solids found in the lakes, shown in Figure 13, are but one indication that the lakes' ecosystems are being degraded.

The biological productivity of each of the Great Lakes is dependent on the supply and balance of essential nutrients. Lakes well supplied with essential nutrients tend to be the most productive biologically. This relationship is the basis for the "trophic" system of lake classification. In the first stage of the trophic system—the oligotrophic—a lake is deep, the water contains few nutrients, and there is little biological life. Over time, as nutrients and sediments are added, the lake becomes more biologically productive and shallower. This stage is called the mesotrophic. As nutrients continue to be

**Figure 13**

**Changes in Total Disolved Solids in the Great Lakes**



Source: A. M. Beeton, "Changes in the Environment and Biota of the Great Lakes," in *Eutrophication: Causes, Consequences, Correctives* (Washington: National Academy of Sciences, 1969), pp. 150–87 added, algal blooms appear, fish populations change, and the lake becomes less useful to man. This final stage is called the eutrophic stage, and the process which leads to it is known as eutrophication. It is a natural process in all lakes and one that normally takes thousands of years. But the inputs of man-derived nutrients and sediments can produce the same effect in a few decades.

Changes have been observed in all the Great Lakes over the past 50 years. The physical characteristics of each have determined its particular response to man's activities. The shallow water environments—bays and inshore waters—that receive wastes undergo the most significant changes. Thus, while a lake as a whole may be classified as oligotrophic, certain of the shallow coastal areas may be eutrophic. This eutrophic condition may eventually reach the open lake, but because of the great depths in the offshore areas, the changes will be gradual. Unfortunately, the shallow water environments that are first altered by pollution are the most important for water supply, fish production, and recreation.

When the population of the drainage basin of each lake is compared to the volume of the lake, one of the major reasons for the different degrees of pollution among the lakes becomes clear. The ratio of population to volume varies from only 0.18 for Lake Superior to 99.25 for Lake Erie (see Figure 12). Lake Superior has a large volume of water to assimilate the wastes from a small population. In Lake Erie the situation is the opposite. The extent of pollution in each of the lakes approximately parallels the ratio of population to water volume.

Changes in the biology of the lakes have also resulted from waterway development. Prior to the opening of the Welland Canal between Lakes Erie and Ontario, Niagara Falls was an effective barrier to the parasitic sea lamprey. The Canal opened the way for the lamprey to enter the upper lakes, where it nearly destroyed the populations of lake trout, whitefish, and burbot—the lakes' only abundant and widely distributed predators (see Figure 14). The Great Lakes Fishery Commission has developed several methods for controlling the sea lamprey, and the Department of the Interior's Bureau of Sport Fisheries and Widlife is now successfully applying these methods in several of the lakes. The Canadian Department of the Environment is conducting a similar program on its side of the lakes.

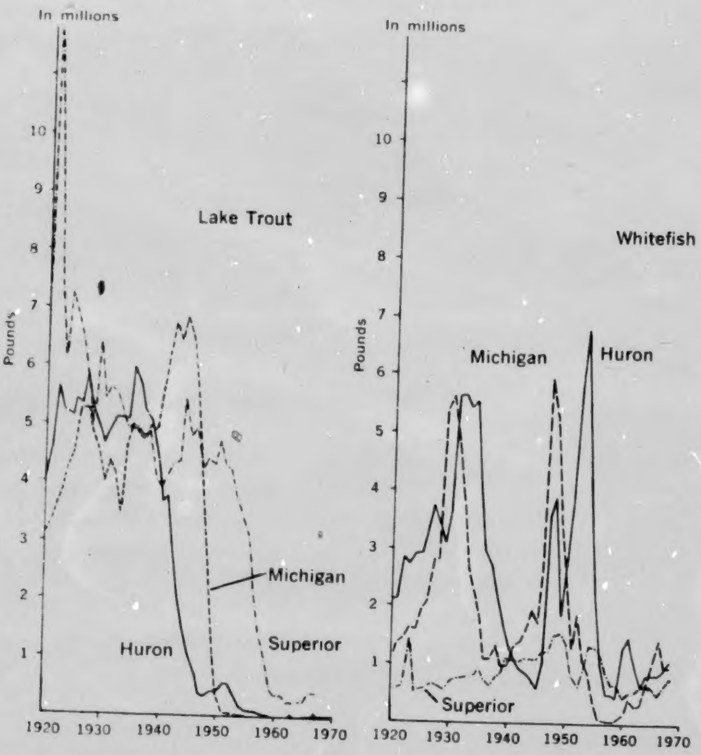
Introduction of the lamprey created conditions favorable to multiplication of the alewife. This small, herring-like marine fish also entered the Great Lakes through the Welland Canal and now dominates the waters of Lakes Huron and Michigan. It periodically creates objectionable conditions when massive numbers die.

Because each of the lakes has its unique characteristics and problems, they are worth discussing separately.

Lake Superior has remained essentially unchanged during the past century, in part because of its large volume. However, a few areas, notably the Duluth-Superior region, are suffering from pollution.

**Figure 14**

**Commercial Production of Lake Trout and Whitefish in the Upper Great Lakes**



Source: Great Lakes Fishery Commission, *Commercial Fish Production in the Great Lakes 1867–1960*, Technical Report No. 3, July 1962, with supplement, 1970

The possibility that asbestos fibers may be being dumped in the lake and are then entering the Duluth drinking water has raised serious national concern. The biological, chemical, and physical characteristics of Lake Superior are considered oligotrophic. Its waters have high transparency, they possess a high dissolved oxygen content and a low total dissolved solids content, and the existing biota are characteristic of nutrient-poor waters. Man's activities have caused some changes in the fish populations. These changes include the introduction of smelt and the decline of lake trout and whitefish.

Because of its large volume, most of Lake Michigan has not yet suffered major environmental deterioration. However, the wastes from a rapidly increasing population at the southern end are causing rapid deterioration of that part of the lake. Although the volume of the lake is large, its flow-through time is very long (only about 1 percent of the lake's volume is drained each year), and wastes which enter it remain for long periods of time. The observed changes include higher concentrations of dissolved solids, oxygen depletion in Green Bay, overproduction of algae, increased numbers of fish kills, and other marked changes in the biota. Such changes in plant and animal life are often the best indicators of a change in the total environment. In southern Green Bay and other restricted areas, most of the normal, oligotrophic biota have been replaced by pollution-tolerant species. Commercial fisheries are no longer permitted to harvest lake trout in Lake Michigan because of the depleted numbers of fish. Less valuable smelt, carp, chubs, and the ubiquitous alewife now constitute a major portion of the total catch.

Most of the inflow to Lake Huron is from Lake Superior and the upper, reasonably clean part of Lake Michigan. Lake Huron is therefore considered oligotrophic, with many of the same characteristics as Lake Superior. The quality of its water has not changed to any great degree in the last century. The large volume of the lake has prevented the increase in waste effluents from having a major impact on the open lake. However, in Saginaw Bay and a few of the more heavily used harbors, pollution has affected the biota, and many of the oligotrophic species are diminishing. Fisheries throughout the lake have also changed: carp have flourished, but lake trout and walleye have been reduced by the lampreys and by poor fishing practices. Recently the whitefish and chub populations have undergone catastrophic decline, but the whitefish are now beginning to come back because of sea lamprey control.

The combined biological, chemical, and physical characteristics of Lake Erie clearly classify it as eutrophic. Its waters have high phosphorus concentrations and are turbid. During the summer, the oxygen in the bottom waters in the central and western basins is depleted. There is nuisance algal growth, pollution-tolerant species are present, and the composition of the commercial fish catch has changed significantly. This eutrophic state stems from the interaction of four factors: the lake basin is extremely shallow and contains a small volume of water; the lake has always received a rich nutrient input from its drainage basin; there is a large megalopolis along the U.S. shore, including such major industrial centers as Cleveland, Toledo, and Detroit; and the lake receives severely polluted water from the major tributaries. The most heavily polluted areas in Lake Erie are the western and central parts of the lake, including the areas adjacent to Detroit, Toledo, Cleveland, and Buffalo.

Lake Ontario is probably best described as mesotrophic—with nutrient availability and biological productivity intermediate between oligotrophic and eutrophic. Its main inflow is the nutrient-rich waters from Lake Erie, but because of its large volume it has not been overtaken by algal growths. The biota consist of those organisms that are also present in Lakes Superior and Huron. Major pollution problem areas are the urban-industrial complex from Hamilton to Toronto and Rochester.

From April 1972 to June 1973, a major U.S.-Canadian field observation program, the International Field Year for the Great Lakes, took place on Lake Ontario and in the Ontario basin. In addition to hydrological, meteorological, and physical limnological processes and properties, observations covered biological and chemical parameters, including the concentrations of important pollutants. The data, which are now being analyzed, will be used to establish baselines and trends in environmental characteristics, material balances within the lake basin system, and simulation models for evaluating management alternatives. These studies will provide not only specific assessments of Lake Ontario but also a broader understanding of lake processes in general.

The Great Lakes are a good example of how man and nature interact to change ecology. Conditions in Lake Erie would not be so bad were it not for the shallowness of the lake and its location relative to the other Great Lakes. Lake Michigan has been spared the problems of Erie, in part because of its size. However, the magnitude of man's activities is so great that even the largest lakes can become polluted if adequate control measures are not taken.

The International Great Lakes Water Quality Agreement, signed in April 1972, represents a joint commitment by the United States and Canada to improve the quality of their international waters by 1975. The efforts to implement this agreement through the International Joint Commission and the water pollution control agencies on both sides of the border hold promise that the quality of the Great Lakes' environment can be preserved and restored.

## Other Efforts to Define Water Pollution Status and Trends

Other efforts to give a better picture of water pollution trends include projects by the Environmental Protection Agency, the National Oceanic and Atmospheric Administration, and the National Sanitation Foundation.

**EPA Eutrophication Study**—EPA has initiated a major study on lake eutrophication—the most important water pollution problem affecting U.S. lakes. The study, which will eventually survey about 1,000 lakes, will assess the extent of eutrophication in each lake, which nutrients cause eutrophication, and the sources of the nutrients. Data from the first 200 lakes will be available next year. As one way to summarize the data, the EPA laboratory at Corvallis, Oreg., is trying to develop a eutrophication index. The EPA study will, for the first time, provide a sound basis for assessing the extent of the eutrophication problem and the factors that contribute to it.

**Water Quality Index**—The National Sanitation Foundation has completed a test of its proposed water quality index on the Kansas River, Kans. The index has also been successfully tested with data from seven other states. These pilot applications show the index to be responsive to changes in water quality. However, several questions, such as the relationship between index levels and acceptable water quality for particular uses, will require further testing and application of the index before they can be answered. Even if the index were adopted, lack of data would be a severe problem because the index requires data on some pollutants which are not measured at most monitoring sites.

The Sanitation Foundation index incorporates nine parameters: dissolved oxygen, 5-day biochemical oxygen demand, turbidity, total solids, nitrates, phosphates, pH, temperature, and fecal coliforms. Each is assigned a weight, ranging from 0 to 1, depending on its effects and the level of the pollutant. Both the parameters and the weights were determined by a panel of 74 water quality experts selected by the Foundation. The index overcomes the problem of the disparate uses to which water is put by having one set of weights which takes account of various uses.

A water quality index has great potential as a management tool. It can identify progress or lack of progress in pollution abatement, aid in selecting the location of sampling stations and the frequency of sample collection, and guide the allocation of fiscal resources among competing programs. The major asset of such an index, however, is its capacity to communicate objectively the status of stream quality and whether it is changing for better or worse.

**Refinement of Enviro Control Study**—EPA is financing a followup study to the Enviro Control analysis done for CEQ and discussed in last year's Annual Report. It will refine the statistical techniques used to measure water quality trends. It will also try to adjust measurements for the effects of temperature change. It will examine in detail the location of the monitoring stations used in the CEQ study and the extent to which location affected the study's results. The study should be finished this fall.

**Ocean Pollution**—In recent years there has been growing awareness of the need to understand the extent and consequences of ocean pollution. Although pollution of certain estuaries and localized coastal waters has long been evident, more recently there has been concern that pollution of the oceans may be occurring on a regional, or even global, scale.

Several recent studies by NOAA have received widespread public attention. In January three NOAA cruises reported finding oil residues in the form of tar balls throughout the Atlantic Ocean. They also found widespread contamination of the ocean by plastic debris in the form of sheets, beads, discs, and also bits of styrofoam.[12] In addition, thousands of pieces of plastic, ranging from tiny scraps to lengths of fishnet 100 feet long, were found littering the beaches of Alaska's remote Amchitka Island. Most of this plastic was believed to have come from foreign fishing vessels.[13]

There is a possibility that this plastic debris, lumps of tar, and other petroleum residues could interfere with some of the basic biological processes in the ocean, and laboratory investigations are underway to determine the effects that such pollution will have. Because plastic does not degrade, once introduced into the environment, it will remain almost indefinitely. As yet, data indicating the extent and trends of oceanic pollution are still relatively sparse, compared with those for inland and localized coastal waters. However, increased attention is being directed toward this problem at both national and international levels.

The Marine Protection, Research and Sanctuaries Act of 1972[14] directs NOAA, in cooperation with other Federal agencies, to initiate comprehensive and continuing programs of research on ocean dumping and ocean pollution. Work is underway within NOAA to establish environmental baselines, against which possible future trends in ocean pollution can be determined. Additional work on this problem, supported by the National Science Foundation as well as other Federal agencies, should also begin to provide a better understanding of the extent of ocean contamination.

During 1971–72 the National Science Foundation's Office of the International Decade of Ocean Exploration (IDOE) carried out an intensive study of the baseline levels of heavy metals, halogenated hydrocarbons, and petroleum hydrocarbons in the oceans bordering the United States.[15] Alterations in trace metal concentrations in the marine environment due to man's activity were found to be restricted to estuarine and coastal areas which are influenced by industrial, domestic, or polluted river runoff. Only in the case of lead, which is transported by atmospheric processes, is there an indication of serious open ocean metal pollution.

The IDOE baseline study found readily identifiable contamination in the open ocean by synthetic chlorinated hydrocarbons, such as polychlorinated biphenyls (PCB), pesticides (DDT) and their metabolites, and petroleum hydrocarbons. PCB, DDT, and their metabolites were ubiquitous in samples taken from the Atlantic and Pacific Oceans and the Gulf of Mexico. The highest levels were in coastal seas, but the open ocean values were high enough to cause concern. High levels of PCB or DDT were often associated with small oil or tar droplets which seem to extract the material from the sea water. These data indicate that petroleum has entered the marine food chain in both coastal and ocean waters. As in the case of the metals and chlorinated hydrocarbons, the highest levels of petroleum were found in coastal seas. Petroleum hydrocarbons were concentrated in the surface films where they may constitute a particular danger for marine organisms.

These observations have stimulated IDOE to initiate two major research programs, one directed at how these pollutants reach the ocean and the other at how they affect marine organisms and communities.

## Land Use [16]

There is growing consensus that control over land use is probably the most important single factor in improving the quality of the environment in the United States. Land use is a term which encompasses many dimensions; as we develop indicators for land use problems, it is essential to be clear about what these problems are.

Land use indicators, like land use regulation, usually focus on competing uses for the same land. Because each of the competing uses is likely to serve some socially beneficial purpose, it is often difficult to interpret indicators in any absolute way. For example, an increase in agricultural land may or may not be desirable, depending on the competing demands. There may be a few absolutes—for example, increases in the amount of unreclaimed surface-mined land are undesirable—but there are not many. The interpretation of data on land use changes usually requires a more complex framework.

One concept used in interpreting land use indicators is "carrying capacity," the intensity of use which, if exceeded, will cause adverse environmental consequences. When deciding among conflicting land uses, one must know an area's natural carrying capacity so that the adverse consequences of exceeding that capacity may be considered. In many cases, one cannot say that this natural carrying capacity should not be exceeded because the adverse consequences usually can be overcome by engineering or other adjustments. Then the relevant question becomes whether the costs of exceeding the natural carrying capacity are worthwhile. Or, put another way, is the "conversion cost" to increase the capacity of land, plus the other costs involved, less than the anticipated benefits?

A report to the Council by Development Sciences, Inc., illustrates this view of carrying capacity with the example of Washington, D.C.:

> The Potomac River and the land which it drains have a certain limited natural capacity to deal with human land use patterns. There are lands of certain soil types and there are water-bearing areas of specific limited quality and quantity. Before World War II and the accompanying population growth of the federal government, the natural cleansing capacity of the river was such that most human wastes were "treated" by natural forces, and low density land use patterns were sustained without excessive pollution or threats to the supply of water.
>
> If the land were zoned according to the carrying capacity of the soil and the river's capacity to handle wastes and supply

water, the Potomac could not have sustained the growth in land use which the demands of the growth in government placed on the natural environment. Instead, the society paid the "cost of conversion" from using land in its natural state by applying technology such as sewage treatment systems and dams and reservoirs to ensure water quantity and quality for the new population.[17]

When the natural carrying capacity of an area is exceeded, the consequent costs can be paid in the form of remedial measures, such as constructing sewage treatment plants, or in the form of increased environmental damages, such as water pollution. In the Washington, D.C., area, some of the costs of conversion clearly have been paid in the form of reduced environmental quality—more water pollution, air pollution alerts, and threatened shortages of water, for example.

Given the small number of absolute prohibitions on land uses and the limitations of the concept of carrying capacity, most land use data must be put in some type of cost-benefit or supply-demand framework if they are to indicate environmental quality. But in most cases such a framework and the relevant costs and benefits are likely to be local or regional. Many land use indicators would have limited, if any, meaning on a national scale unless they were aggregates of rather complex local or regional indicators.

For example, there is no national policy against converting agricultural or forest land to residential use, and thus national figures on such conversions do not indicate whether land use is improving or deteriorating. To make such an evaluation, one would need to look at each area where conversion is taking place and evaluate the demand for housing in the area, the regional need for open space, the value of the crops or timber produced there, the effect of the conversion on transportation routes and commercial development, the methods for disposing of the wastes generated by the residences, and several other factors. The Federal Government cannot evaluate such changes on a national basis.

The large number of factors to be considered in making and evaluating land use decisions may mean that computer-based models, which can simulate the results of alternative decisions, will be a necessary adjunct to a system of indicators. Several projects to develop such models are underway or have been completed. For example, the National Science Foundation sponsored development of a national model linking agricultural policy, land use, and water quality by Dr. Earl Heady of Iowa State University. NSF is also supporting work at Oak Ridge National Laboratory to develop regional models that can be used to determine the environmental impact resulting from the location of industrial, commercial, residential, and recreational development. The OBERS model, developed by the Departments of Commerce and Agriculture for the Water Resources Council, projects estimated population, economic activity, and land use for regions of the United States. It may also be useful for considering alternative land use policies. The Strategic Environmental Assessment System being developed by EPA is using the OBERS projections, economic and environmental models, and forecasts of land use and other changes to estimate the condition of national and regional environments 10 to 15 years in the future.

Problems of land use in the United States may be arbitrarily classified into three categories. First, we are concerned about the availability of certain types of land, such as enough agricultural land to grow food, adequate open space for recreation in densely populated areas, and sufficient timberland to meet national pulp and lumber demands. Second, we need to control development in areas of critical environmental concern, including areas of particular environmental value such as wetlands, other rare or valuable ecosystems, and scenic or historic areas. Such areas also include land which, if developed, may pose a direct hazard to man: for example, flood plains, steep slopes, soils unsuitable for development, and earthquake fault zones. Third, there are types of land use development and practices that lead to other problems which, in turn, may have adverse environmental consequences. These include unreclaimed surface mining, practices that lead to soil erosion, urban development patterns which produce pollution, and the spread of areas impervious to water.

Each of the three categories will be discussed after they are put in the context of national trends in land use.

## National Trends in Land Use

Total acreages for different land uses in the United States are not very informative. Last year's Annual Report presented such data for the period 1900–1969. Despite the massive changes that took place during that period, the aggregate data show little change.[18]

The U.S. population has become increasingly urbanized, and many of the most important land use changes and issues occur in metropolitan areas. Maps of standard metropolitan statistical areas (SMSA's) published by the Bureau of the Census show an increasing share of the Nation's land lying within metropolitan areas. By 1970, 13 percent of the land in the contiguous 48 states was within the SMSA's (see Figure 15).[19]

It would be a mistake, however, to consider all land in metropolitan areas as being urbanized. In fact, urban uses accounted for only about 10 percent of the land within the SMSA's, or about 1.3 percent of all land in the contiguous 48 states (see Figure 16).[20] The SMSA's are largely statistical artifacts because they are composed of entire counties and thus include not only cities but also all of the rural or urbanizing land in the county where the city is located.[21] To take an extreme example, a large portion of the San Bernardino-Riverside SMSA in California is the Mojave Desert because both the Desert and the cities are located in San Bernardino and Riverside Counties.

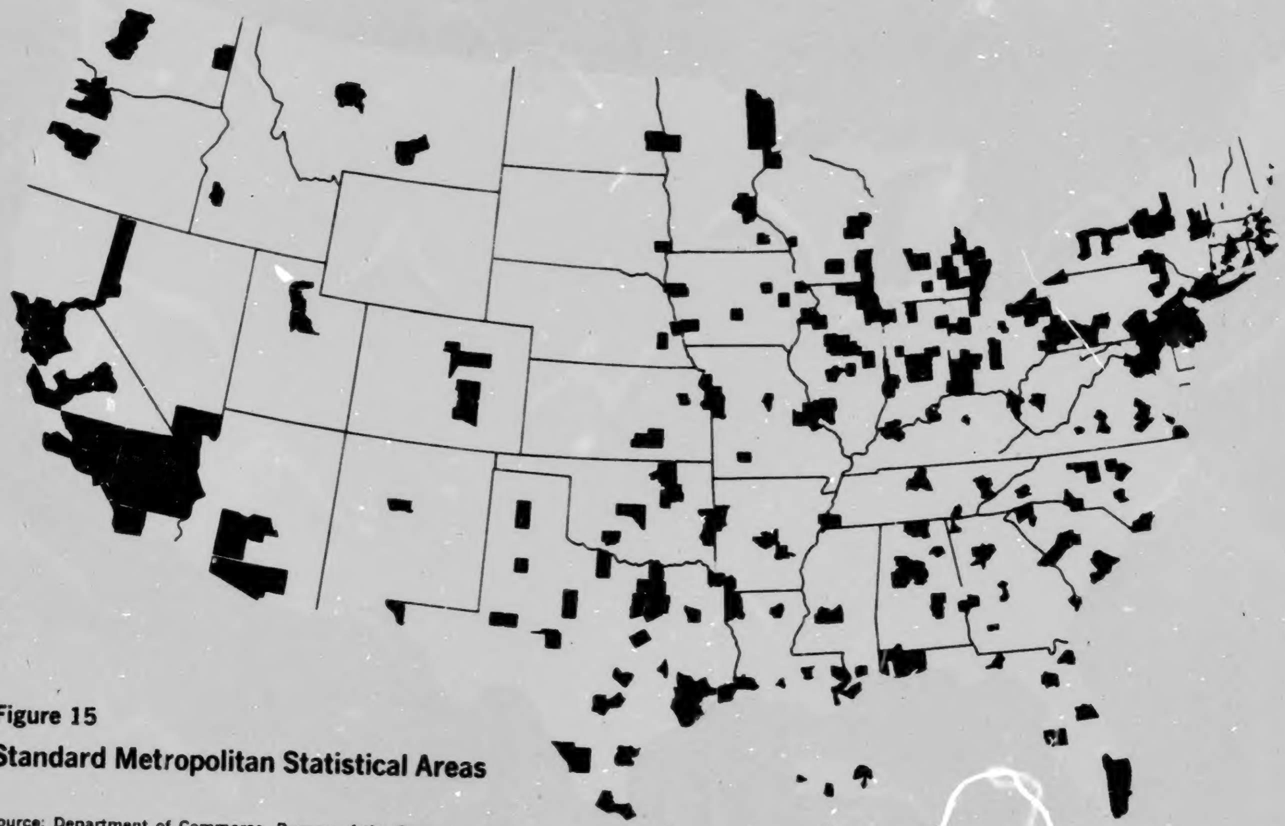


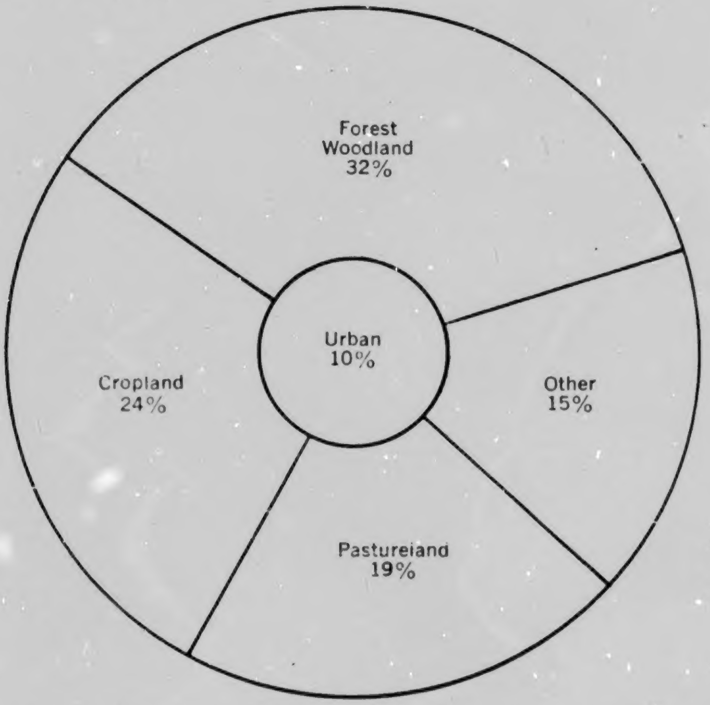
Figure 15

**Standard Metropolitan Statistical Areas**

Source: Department of Commerce, Bureau of the Census, *Number of Inhabitants, U.S. Summary 1970 Census of Population: PC(1) : A1 U.S. Summary* (Bureau of the Census, Washington, December 1971), pp. 8–9

**Figure 16**

**Land Use within SMSA's 1970 for the 48 Contiguous States**



Source: Robert C. Otte, "Human Considerations and Land Use," in *National Land Use Policy: Objectives, Components, Implementation* (Ankey, Iowa: Soil Conservation Society of America, 1973), p. 78

The largest category of land within the SMSA's in 1970 was forest woodland, which accounted for almost one-third of the land area. One-quarter of the land was devoted to crops. In 1964, the last year for which data are available, 16 percent of U.S. wheat, 17 percent of our corn, 60 percent of our vegetables, and 43 percent of our fruits and nuts were produced *within* metropolitan areas.[22]

The various land uses within metropolitan areas do not arrange themselves into neat geographical patterns. Because of the way American cities have developed over the past 50 years, urban uses are widely interspersed with other kinds of uses. This intermixture of different uses has come to be known as urban sprawl. The pattern is not just a phenomenon of our newer cities. For example, Figures 17 and 18, based on data from aerial photographs, show the scatter of built-

Figure 17

Boston, Built-up Land Use 1970

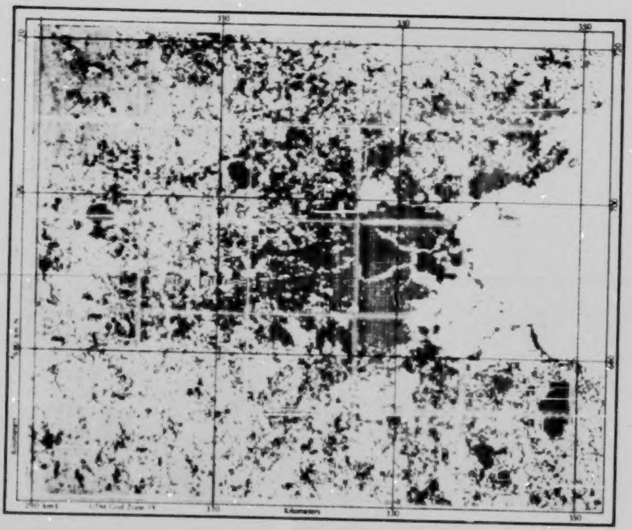
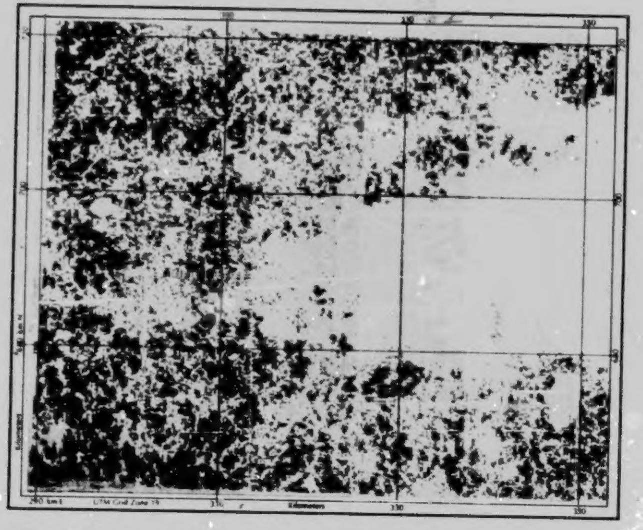

UTM Grid Zone 19
Kilometers

Figure 18

Boston, Forest Land Use 1970

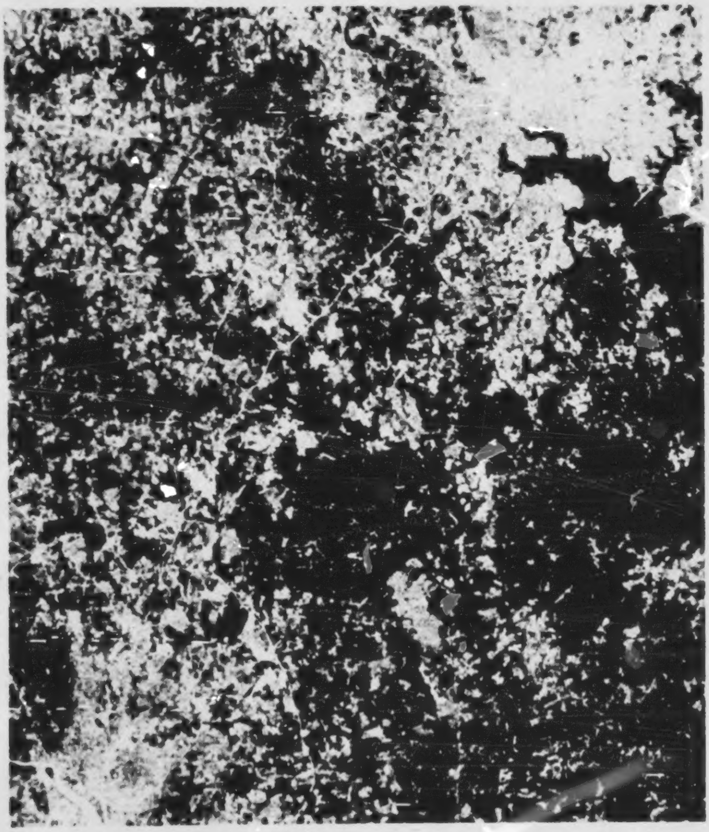

UTM Grid Zone 19
Kilometers

Source: Department of the Interior, U.S. Geological Survey, Census Cities Experiment, based on research at Dartmouth College as part of the U.S. Geological Survey-National Aeronautics and Space Administration Geographic Application Program up areas and forest lands surrounding Boston, one of our older cities. The figures do not show the entire SMSA but cover an area of about 1,600 square miles. Figure 19, taken from an earth-orbiting satellite, shows the same pattern for the Baltimore-Washington megalopolis.

Given the mixture of urban and other uses, population density and concentration figures may provide a better overall picture of urbanization than metropolitan land use data. One way to show the increased concentration of the U.S. population is depicted in Table 5. It shows

**Figure 19**

**The Baltimore-Washington Megalopolis** [1]



[1] Baltimore is at the upper right hand corner of the photograph, Washington, D.C., at the lower left. The dark areas are woodland or water; the light areas are urban or agricultural.

Source: Earth Satellite Corporation

that the portion of the total U.S. population living in the most populated 5 percent of U.S. counties increased from 56.8 percent to 60.8 percent between 1950 and 1970. This increased *proportion* of population, combined with the significant rise in *total* population, means that many more Americans are living in dense urban areas than ever before.

Table 5 also shows that the top 1 percent of U.S. counties declined in the proportion of population that they contained, revealing a second major facet of U.S. urbanization—although more and more people live in large urban areas and although the concentration of the *total* U.S. population is intensifying, the population density within metropolitan areas is declining. The land area occupied by urbanites is growing faster than the number of urban dwellers.[23]

While becoming more and more urbanized, we also have been changing our patterns of urban living. "Urban" is no longer just an apartment in the downtown area of a city. It is also a ranch-style home in the suburbs. Most residential development is taking place outside the central city and is of much lower density than past development. As people move to the suburbs, industrial and commercial development is shifting to outlying areas, and the downtown is being renewed at lower densities, with more open space, more parking, and more freeways.

The population of central cities rose only 5.2 percent between 1960 and 1970, while the metropolitan population outside the central city jumped 28.3 percent.[24] By 1970, the population living in the suburbs exceeded the central city population by approximately 10 percent (54.5 percent to 45.5 percent). This shift in population growth continues.[25]

Figure 20 clearly shows this change in the pattern of urbanization for four cities. Their density curves are flattening, reflecting decreased population in the downtown area and increased development in the suburbs. The main cause of this trend has been the growing reliance on automobile and truck transportation, which has stimulated a low-density pattern of development.

The central city is far from dead, as the discussion in Chapter 1 indicates, and the highest population densities are still centered there. (See the population map for metropolitan Washington, Figure 21.) However, the general trend clearly shows that most people who have a choice, generally those who are white and who have money, settle in the suburbs. The result has been a widening disparity between income levels in the suburbs and the central city. This is dramatically shown by the geographic distribution of median family income in the Washington area (Figure 22).

In a study conducted for the Council, the Earth Satellite Corporation examined changes in land use patterns in five cities: Baltimore,

**Table 5**

## Measures of Concentration of Population in the United States for 1950–1970

| Proportion of counties [1] | Proportion of population 1950 (percent) | 1960 (percent) | 1970 (percent) |
|---|---|---|---|
| Top 1 percent | 35.6 | 35.5 | 34.9 |
| Top 5 percent | 56.8 | 59.1 | 60.8 |
| Top 10 percent | 67.2 | 70.2 | 71.8 |
| Top 25 percent | 82.8 | 84.9 | 86.3 |
| Top 50 percent | 95.3 | 95.8 | 96.3 |
| Gini ratios [2] | .769 | .789 | .802 |
| **Total population (million)** [3] | **150.6** | **178.5** | **202.1** |

[1] Including independent cities.

[2] Zero would mean equal distribution and unity would be maximum concentration or inequality.

[3] 48 contiguous states.

Source: *Rural Development: President's Annual Report to the Congress on Government Services to Rural America* (Washington, 1972), p. 9.

Denver, Kansas City, Los Angeles, and Riverside, Calif. The major land use trends for Denver are depicted in Figure 23. They reflect many of the population changes noted above.

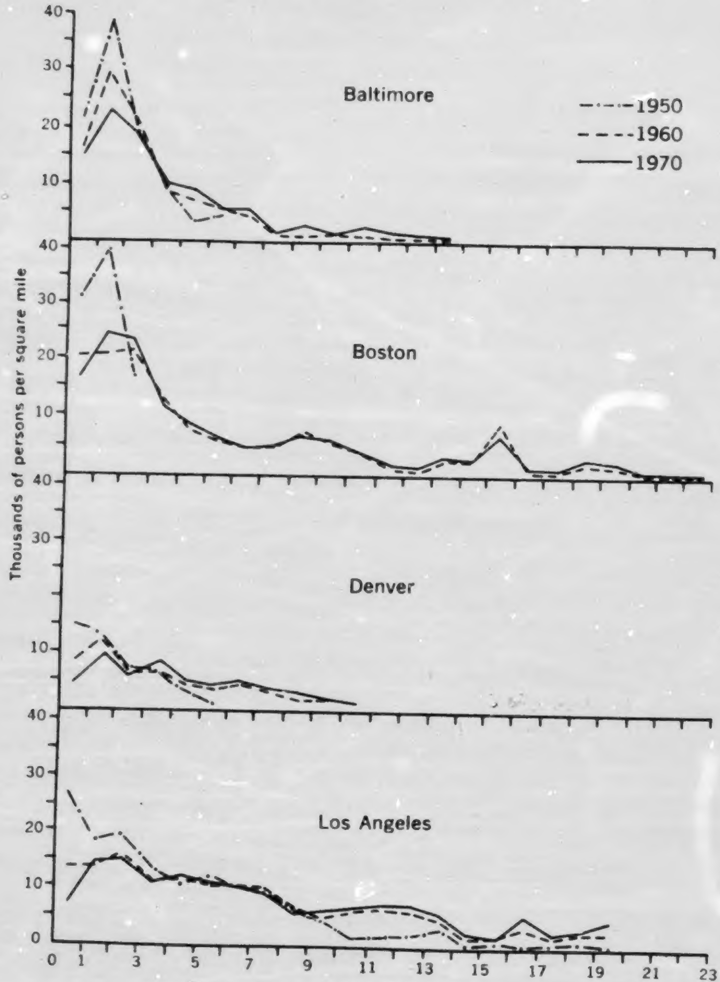
All five cities show the same type of residential land use expansion: outward radial growth at low density along transportation lines, followed by filling-in of the space between the highways. In the older cities, like Baltimore and Kansas City, the outward expansion has left behind large areas of urban decay, as those who could move did and public investment was not adequate to compensate for the lack of private investment to maintain and renew the inner city.

Commercial land use in the five cities exhibits many of the same tendencies toward spatial expansiveness. Retail firms in the central business district must often compete with outlying satellite commercial centers. Where they do, the growth of the central business district has not kept pace with the population growth of the region. Nearly every city experienced some growth in the central business district. But this has been due to an increase in offices serving the region, thus offsetting the loss of more localized activity. That is, the downtown area has become more region-serving and less city-serving.

Industrial growth has been more evenly divided spatially than

Figure 20

## Composite Population Density Curves

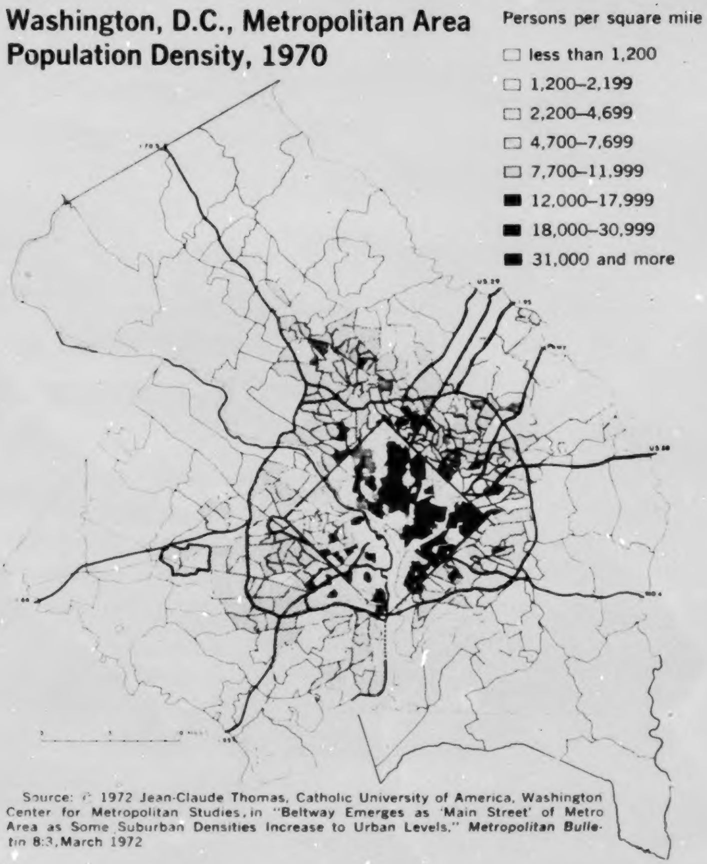


Source: Earth Satellite Corporation

residential and commercial growth. While industrial land use in the outlying areas has grown, there also has been either growth or no loss of industrial activity in the downtown area. Most of the industries located in the central city apparently are tied there because of heavy

**Figure 21**

## Washington, D.C., Metropolitan Area Population Density, 1970


Persons per square mile
☐ less than 1,200
☐ 1,200–2,199
☐ 2,200–4,699
☐ 4,700–7,699
☐ 7,700–11,999
■ 12,000–17,999
■ 18,000–30,999
■ 31,000 and more

Source: © 1972 Jean-Claude Thomas, Catholic University of America, Washington Center for Metropolitan Studies, in "Beltway Emerges as 'Main Street' of Metro Area as Some Suburban Densities Increase to Urban Levels," *Metropolitan Bulletin* 8:3, March 1972

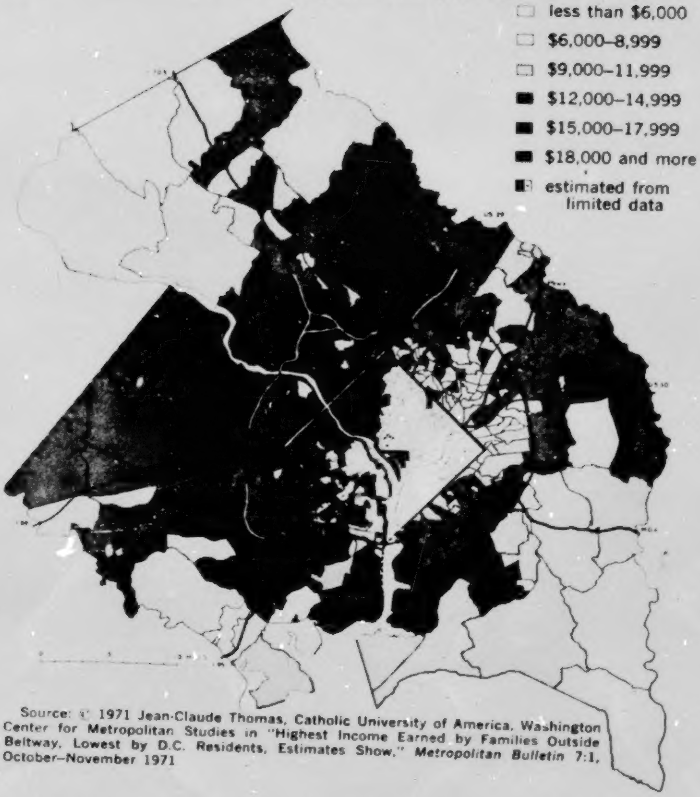
capital investment, transportation, and communication needs or because they rely on central city labor markets.

### Land Availability

A few land uses have such obvious social value that a simple indicator of their availability might be useful for evaluating trends in environmental quality. However, even for these uses, a truly meaningful indicator should include supply-demand considerations. Agricultural land for food production and recreational open space are two land categories which could be measured in terms of availability.

Figure 22

## Washington, D.C., Metropolitan Area Estimated Median Family Income, 1970



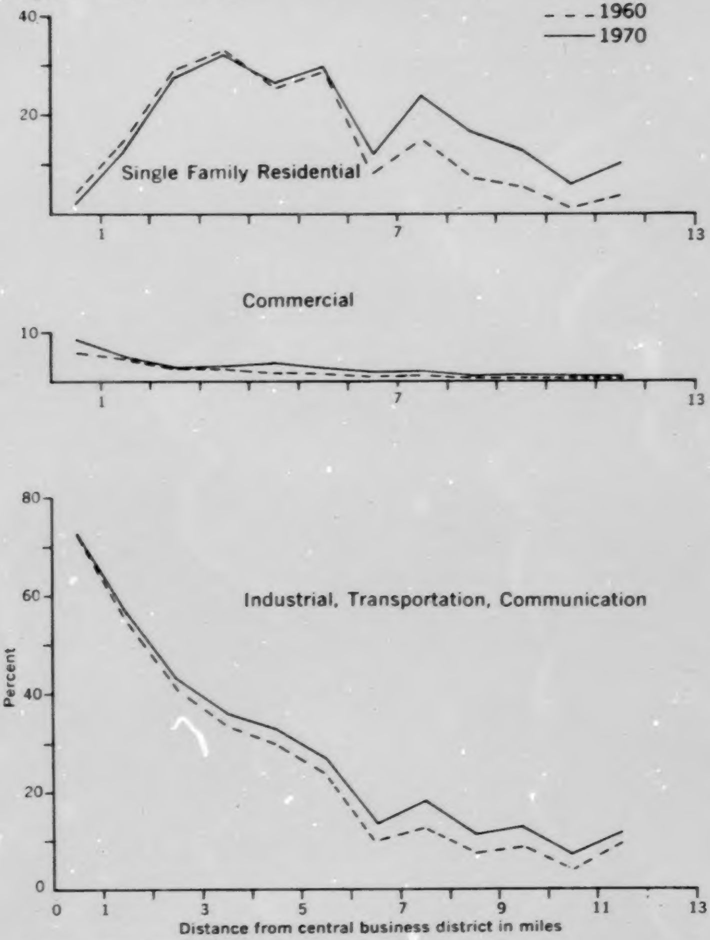
Source: © 1971 Jean-Claude Thomas, Catholic University of America, Washington Center for Metropolitan Studies in "Highest Income Earned by Families Outside Beltway, Lowest by D.C. Residents, Estimates Show," *Metropolitan Bulletin* 7:1, October–November 1971

**Agricultural Land**—The amount of land in the United States used for growing crops has decreased for more than 20 years. We now plant 9 percent less land in crops than in 1950, but we have increased farm output by 40 percent.[26] We have been able to produce more on less land because of new technologies—mechanization, improved varieties of plants and breeds of animals, chemical pesticides, and synthetic fertilizers.

The Economic Research Service of the Department of Agriculture has made various projections of the need for and availability of cropland in the year 2000 and beyond. Using fairly conservative assumptions for productivity and population growth, the OBERS report to the Water Resources Council predicted that approximately 310 million acres of cropland must be harvested by the year 2000 to grow enough crops to meet U.S. domestic and export needs. This figure

Figure 23

Land Use by Distance from the City Center: Denver



Source: Earth Satellite Corporation

compares to 287 million acres of cropland in 1964 and 333 million in 1954.[27]

For some time, projections of need for agricultural land have indicated no foreseeable shortages, but within the past year world demand for U.S. agricultural products has increased substantially. This is partly due to unfavorable weather in the Soviet Union, China, India, and elsewhere. Another factor is a decline in the fish catch off the coast of South America and a sharp decline in the production of fishmeal for livestock feeding. The result is an increased demand for soybeans as an alternative source of protein. A third factor has been the steady upgrading of diets in other countries, particularly in Western Europe and Japan.

All this has had an effect on demand for U.S. farm products and on use of cropland in the United States. In recent years, increases in exports have been largely offset by increases in output per acre. Between 1960 and 1971, farm exports represented the production of about 68 million acres on the average. This acreage equivalent varied from 77 million acres in 1963 to a low of 54 million acres in 1968. In 1971, 62 million acres was used for exported products, and the figure jumped to an all-time high of 85 million acres in 1972.[28] Although some of the conditions that have increased exports may be transient, others may continue, resulting in the need to use more land to produce agricultural products.

The OBERS projections assume a continuing increase in productivity per acre. One can envision circumstances in which such an assumption would not hold. The use of some pesticides has already been restricted, and further restrictions, as well as restrictions on the use of chemical fertilizers, could be imposed. A series of crop diseases could cause widespread devastation. But the likelihood of such events severely reducing productivity is probably less than the likelihood of new breakthroughs in agricultural technology—improved biological pest control, dramatic advances in seed genetics, and fabricating food from basic raw materials, for example. On balance, there seems little cause for concern over the availability of cropland, although a sharp rise in food exports could cause some short-term problems.

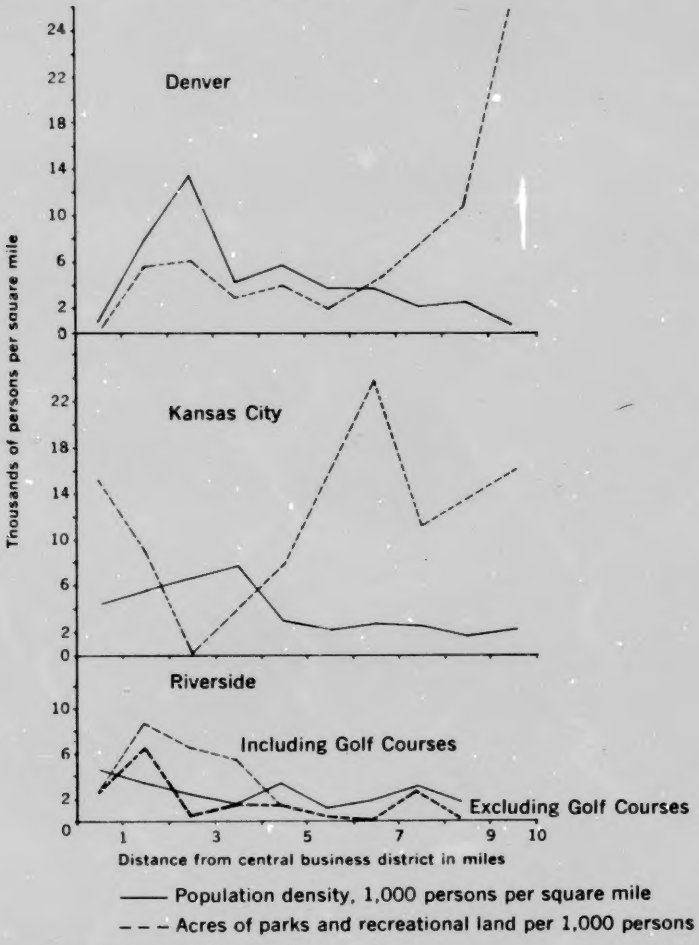
**Open Space and Parks**—There is general agreement that maintaining adequate open space is desirable, particularly in urban areas. However, the widely differing ideas about how much open space is desirable and achievable within urban areas and the lack of consistency of definitions used to measure open space make it very difficult, if not impossible, to establish indicators for open space.

Although urban open space is usually thought of as providing recreation, it serves many other purposes as well. Open space can provide beauty, privacy, and variety; moderate temperature; and create a sense of spaciousness and scale. It can protect a water supply; provide a noise and safety buffer zone around an airport; or substitute for development on unsuitable soils, in flood plains, or in earthquake zones.

An important factor, which is related to but separate from the availability of open space, is the availability of recreational facilities. Once again there are no national standards because of the widely differing circumstances in individual communities concerning the characteristics of the population, climate, and terrain. Differences

Figure 24

## Parks and Recreation Land Use vs. Density: Denver, Kansas City, and Riverside



Source: Earth Satellite Corporation

among communities in the amount and distribution of open space and recreational facilities depend upon the amount felt desirable by political and community leaders, availability and cost of land, the extent to which the private sector provides leisure facilities, the income of the population, the region, the population density, and other characteristics of a community.

Various agencies have established goals or standards for how much open space is desirable, but there is a wide discrepancy among the standards. The American Society of Planning Officials has recommended 10 acres per 1,000 people for smaller cities and 4 acres per 1,000 people for larger cities. The State of Missouri recommends 55 acres per 1,000 people; the State of Oklahoma recommends 33.[29] Given the factors that determine demand, it is unlikely that any single national standard can or will be established.

Data on the existing availability of public open space come from local sources, usually from a multitude of agencies in any single urban area. The data vary widely in accuracy and are based on different definitions. For example, cemeteries, country clubs, and school playgrounds are considered public open space in some areas but not in others.

Despite these problems, studies of open space in particular cities can tell us something about environmental quality. For example, Figure 24 shows park acreage compared with population density in Denver, Kansas City, and Riverside, Calif. In Kansas City, park acreage per 1,000 persons is lowest where the population density is highest. Denver parkland is more closely correlated with population distribution. Both density and park acreage are low in Riverside, probably because of the greater reliance on private open space around homes.

Park acreage is comparatively large in the outlying areas of both Denver and Kansas City, reflecting the low acquisition costs for park land in the outlying, less densely settled areas of a city. In one respect, acquisition of such outlying land is an example of forethought and planning, but it may also mean neglect of those areas of the city most in need of open space. A small park in a very densely populated area may be much more valuable to the public than a large park in a sparsely settled area.

The large number of variables that determine supply and demand of urban open space and the variety of uses which it serves make the development of open space indicators a complex and perhaps unachievable undertaking. Insofar as the focus is on recreational use of open space, the simple measurement of park acreage is an inadequate and perhaps deceptive indicator. The most important variables concerning recreational open space in urban areas are the availability of recreational facilities and how much they are used. Thus the many factors that determine demand for public recreation facilities must be considered along with the supply of open space.

## Areas of Critical Environmental Concern

Areas may be of critical environmental concern because they serve a vital ecological, cultural, biological, or aesthetic function. A good example of this type of area is the Nation's wetlands. Areas are also of concern if they pose dangers when developed. Development in flood plains and development on unsuitable soils are examples of this type of problem.

**Wetlands**—Wetlands are a vital natural resource, characterized by fragile biological and ecological regimes. Some serve as important recharge areas for replenishing ground water. Coastal wetlands may provide a natural barrier that prevents subsurface fresh drinking water supplies from mixing with undrinkable ocean waters. In many shore areas, the mud, sand, and vegetation of wetlands create natural buffer zones to dampen the force of storm-driven waves, thus providing a barrier for areas farther inland. Wetlands are also prime habitat and breeding grounds for both aquatic and airborne wildlife; an estimated 60 to 70 percent of fish caught in U.S. coastal waters, either commercially or for sport, would not be there if at one time they had been unable to find shelter, safe spawning, or nutrients in a wetland.[30] Further, coastal wetlands are unique in appearance, contrasting sharply with both developed and other natural areas; they offer a high degree of diversity in the natural landscape.

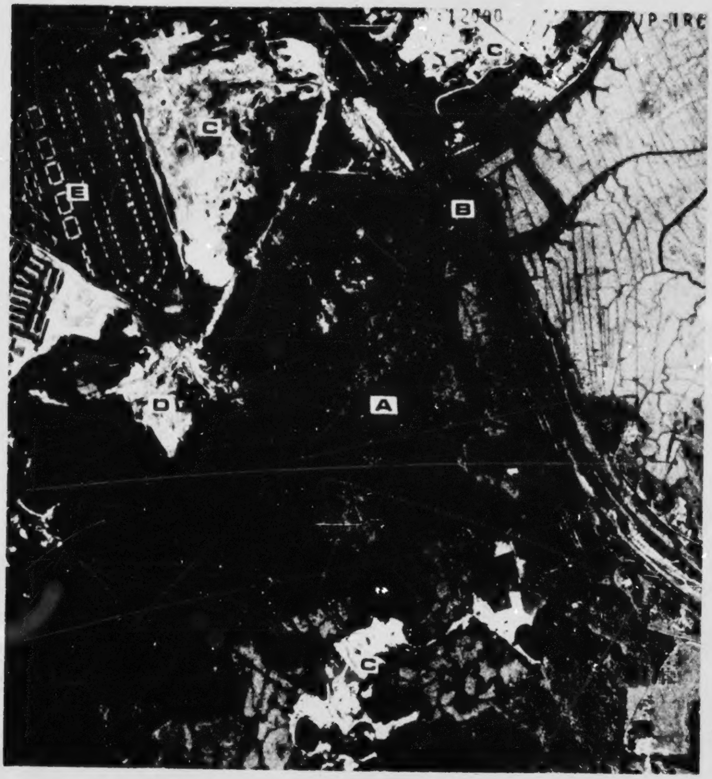
Because of their beauty and their accessibility to water transportation, wetlands have always been targets for development. In the past, their development has been abetted by government. The Federal Swamp Land Acts of 1849, 1850, and 1860 paved the way for the transfer of nearly 65 million acres of wetlands in 15 states from Federal to state administration in order to expedite their drainage.[31] In recent years, however, the Federal Government and several coastal states have proposed or enacted legislation to ensure that future wetlands development will be consistent with the ecology of the wetlands environment. (See the land use section of Chapter 5.)

Figure 25, which shows an area of New Jersey south of Raritan Bay, demonstrates dramatically five types of development that can impinge on wetlands: A) a saline wetland extends from the bottom left of the photograph to the upper right; it has been extensively ditched in an effort to control mosquitoes; B) the Garden State Parkway is seen cutting across the wetlands; C) in three areas, as noted, surface mining is evident; such activities have caused erosion problems and have affected the viability of the wetlands and local water quality; D) in the center left, a solid waste disposal site imperils both land and water quality; suspended sediment runoff from cleared areas is apparent on the original photograph; and E) high-density housing developments are encroaching onto the wetlands in the upper right of the photograph. New Jersey is one of the States that has enacted legislation to control wetlands development.

The study conducted by the Earth Satellite Corporation for the Council examined three areas to trace patterns of urban growth in coastal wetlands: Ocean County, N.J.; Orange County, Calif.; and Hillsborough County, Fla. In the Ocean County study area, several major high-density residential developments on which construction began in the 1960's consumed 14 percent of the wetlands area and

**Figure 25**

**Development in New Jersey Wetlands**



Source: Earth Satellite Corporation

affected a substantial additional area in the wetlands and shallow coastal waters before State legislation halted them in 1970. The rate and character of development in Florida were similar.[32]

In Southern California, the extent of coastal wetlands is more limited than in the East. The area studied contained three tidal lagoons. By 1947, they had been contained by dikes and one had been ditched and diked for intensive oil production. By 1972, another lagoon had disappeared, replaced by high-density residential development.

**Development on Flood Plains**—Urbanization of flood plains has been a continual process in the United States. In many large cities the locational advantages of easy transportation, power supply, and waste disposal have favored development on the flood plains. All too often, such development has taken place without adequate consideration of the associated hazards and problems.

Historically, the flood plains were intensively developed because of the need of industries to be near water. In more recent years, the pressure of increased population on land resources has been a major factor leading to encroachment on flood plains. Land availability figures prominently in the use or nonuse of flood plains, although even in some places with declining populations, new development takes place in the flood plain. When city populations grow to between 5,000 and 25,000, the pressure to use vacant land begins to encourage development in the flood plains.[33] Industrial and transportation uses have usually accounted for the most significant development. But with further growth of urban areas, residential development in flood plains also becomes significant.

Three areas were picked in the Earth Satellite study to illustrate the changes in flood plain land use characteristics between 1960 and 1970: Baltimore, Denver, and Kansas City. In each city, residential development in the flood plains increased substantially over the 10-year period, even encroaching on tributaries and upstream areas. Industrial and commercial uses increased only slightly, apparently because many new businesses preferred more accessible suburban locations.

Land uses appropriate for flood plains, especially public parks, increased in Kansas City and Denver. Both cities have encouraged open space conservation in flood plains and other environmentally hazardous areas. However, neither city has prevented residential development on the flood plain.

In the Denver urbanized area, the estimated portion of flood plain land in residential use increased from 9.2 percent in 1960 to 29.9 percent in 1970. This 225 percent increase in residential use compares to a 50 percent increase for the region as a whole. Part of this increase in flood plain development was due to the beginning of construction of the Chatfield Dam after major floods hit the area in 1965.

Despite the fact that the Federal Government has funded flood protection and prevention projects since 1936, national losses from floods have increased because flood plains have been put to residential and other intensive land uses. Such losses now amount to a national average of almost $2 billion annually.[34] Although Federal flood control funding was implemented to protect already existing properties, it has had the effect of encouraging new development projects which increased flood plain occupancy.

The Army Corps of Engineers—the primary agency responsible for building Federal flood control projects—has recognized the problem of flood plain development. It has established a Flood Plain Management Services Program, with units in each of the 47 Corps field offices, to encourage and assist communities that desire to control land use in flood plains. The Federal Government has taken a number of other steps to deal with flood plain development. For example, Executive Order 11296 calls on all agencies to recognize flood hazards in their construction and grant programs. (See the discussion of proposed new legislation in the land use section of Chapter 5.)

As we noted earlier, most land use questions must be considered in a supply-demand or cost-benefit context. In a few cases, the advantages of locating on a flood plain may outweigh the intermittent cost of damage. There can be little question, however, that there are many locations where millions of dollars could be saved by locating high-value industrial, commercial, and residential developments outside the flood plain and developing the land along the rivers for parks and other low-density uses.

**Development on Unsuitable Soils**—Some of the problems discussed above, such as erosion and flooding, are due in part to the type of soil on which development takes place. Development on unsuitable soils can also cause a variety of other problems—from water pollution by septic tanks to destruction of buildings by landslides.

The nature of the soil differs widely across the United States, and the types of problems that characterize development on unsuitable soils vary from area to area. Three areas with quite different soils were examined in the Earth Satellite study: Montgomery County, Md.; Hillsborough County (Tampa), Fla.; and Ventura County, Calif. Within each of these counties some soils are well suited for development and others are not.

In Montgomery County, the most common soil problems are shallow bedrock which results in water pollution by septic tanks, poor internal soil drainage which causes basement flooding, and "shrink-swell" properties in some of the clays which can cause postconstruction damage to building foundations, roads, and other installations. In Hillsborough County, the most common kinds of unsuitable soils are those with a high water table. In such soils the pollution of ground water by septic tanks and the likelihood of flooded basements are distinct hazards. In Ventura County, the main limitations on urban uses are steep slopes, susceptibility to erosion, internal drainage problems, and the hardpan or water table depth. Within the Southern California valley and mountain coastal region, where Ventura County is located, the serious land-related hazards to urban uses are damage from floods, erosion, and landslides. Construction on earthquake faults also poses obvious dangers.

In each of the three study areas, the Earth Satellite study divided the soil areas into four categories of suitability for development: good, fair, poor, and very poor. The amount of development taking place in each category was then determined.

In Montgomery County, as much development took place on unsuitable soils as on suitable soils (see Table 6). Recent urban expansion appears to have proceeded without much consideration of soil properties that relate to urban use. It also appears that development

**Table 6**

## Development by Class of Soil, Montgomery County, Md.

[Mileage zone from city center [1]]

| | 8.5 | 11.0 | 13.5 | 16.0 | 18.5 | 21.0 |
|---|---|---|---|---|---|---|
| Percent of soils in urban use—1957 | | | | | | |
| Good and fair soils | 83 | 59 | 27 | 10 | 4 | 1 |
| Poor and very poor soils | 45 | 32 | 24 | 7 | 3 | 1 |
| Percent of soils in urban use—1971 | | | | | | |
| Good and fair soils | 86 | 67 | 47 | 20 | 18 | 3 |
| Poor and very poor soils | 45 | 40 | 48 | 13 | 17 | 1 |
| Percent increase in urban use, 1957-71 | | | | | | |
| Good and fair soils | 4 | 14 | 74 | 100 | 450 | 300 |
| Poor and very poor soils | 0 | 24 | 100 | 86 | 565 | 0 |

[1] City center defined as the zero mile marker just south of the White House, Washington, D.C.

Source: Earth Satellite Corporation, "Land Use Change and Environmental Quality in Urban Areas," prepared for the Council on Environmental Quality, April 30, 1973, p. 174.

on unsuitable soil did not occur because land with more suitable soil was lacking.

In Hillsborough County, better (good and fair categories) soils have been brought into urban use at about twice the rate of unsuitable (poor and very poor) soils. Developers and home purchasers in this area were more sensitive to the costs of building on unsuitable soils than those in Montgomery County, in part because the severity of the soil problems in Hillsborough was very obvious.

Many inhabitants of Ventura County have chosen the status of a hillside home over the greater safety of more suitable land. Substantial residential building has taken place on areas of steeply sloping soils subject to erosion, gullying, and landslides, while areas with soils more suitable for urban development have been left unused.

Development on unsuitable soils is the cause of many environmental problems of major concern to homeowners and local communities across the entire Nation. Many problems could be avoided if the unfavorable soil properties were identified before development through the use of soil surveys such as those prepared by the Soil Conservation Service of the U.S. Department of Agriculture. The potential benefits of such surveys can be illustrated by examples of what happens when they are not used. A school in Fairfax County, Va., suffered $250,000 in structural damage because the school site was selected without a soil survey. Soils only 500 feet away were favorable. Communities have lost hundreds of thousands of dollars because pipes were laid in unsuitable soils. In a 7-county area of southeastern Wisconsin, it was estimated that use of soil surveys would save $300 million over the next 25 years in the cost of residential land development by ensuring that new homes were not built on soils unsuitable for septic tanks.[35] The Soil Conservation Service estimates that soil surveys cost only 50 cents to $1 per acre, so the cost-benefit ratio of making and using such surveys to guide development is very high.

### Land Use Effects

The broadest, and probably the most significant, land-related problems are secondary consequences of land use patterns and practices. These patterns and practices create problems such as pollution, which in turn endanger man and his environment.

Patterns of land use are a major determinant of pollution levels in any area. The greater the distances that must be traveled between home, workplace, and shops, the more air pollution will be generated by automobile travel. Significant water pollution problems can be generated by development on lakeshores or by placement of septic tanks in unsuitable soil. Many forms of industrial pollution may be reduced by siting a plant so that its wastes can be productively utilized by a neighboring plant. For all types of pollution the degree of concentration of principal pollution sources is a key factor in the level of pollution to which the population is exposed.

Land use patterns also play a significant role in the consumption and availability of natural resources. Pollution often represents misplaced resources. Thus, for example, the added air pollution generated because of longer travel distances also means wasted gasoline. Land development can lead to reduced water supply (by building over ground water recharge areas, for example), reduced soil capability for growing crops (by erosion and poor farming practices), and reduced ability to extract mineral resources (by building in areas where such resources are found).

The Council, in cooperation with EPA and HUD, is conducting several studies to determine more precisely the secondary impacts of development on the environment. These studies include the impacts of highway and sewer construction, second-home developments, and the costs of alternative residential development patterns.

Three problems are covered in this section—erosion, unreclaimed surface mining, and the increasing land area covered by impervious surfaces such as roads, buildings, and parking lots. Erosion is an environmental problem arising from a variety of land use practices; surface mining is a particular type of land use which gives rise to a number of environmental problems; impervious surfaces are a characteristic of all types of urban development. Thus each is a different type of land use issue, but each represents patterns of development which can create adverse environmental impacts.

**Erosion**—Each day huge amounts of soil in the United States are washed off the land into rivers and streams. The results are a reduction in quality of the remaining soil and water pollution in the form of sediment, nutrients, and other contaminants attached to the sediment.

The Soil Conservation Service (SCS) estimates that more than 3.5 billion tons of soil is lost each year through erosion from the approximately two-thirds of U.S. land that is privately owned. About 40 percent of this soil becomes waterborne sediment in streams.[36]

Although no fully accurate data are available, it appears that total soil erosion losses have been sharply reduced in recent years. SCS considers cropland adequately treated against erosion if soil loss from the land is less than 5 tons per acre per year. It estimates that soil loss from properly treated pastureland averages less than 2 tons per acre per year; from rangeland, about 1.5 tons per acre per year; and from forest land, about 0.5 tons per acre per year. The portion of privately controlled land which is adequately treated to minimize erosion has risen from 35 percent in fiscal year 1965 to over 50 percent in fiscal year 1972.[37] However, this measure of overall progress does not take into account such major problems as huge sediment losses at suburban construction sites which can cause severe local water quality problems.

The dimensions of the erosion problem may be seen from Geological Survey data on sediment discharged to the oceans.[38] Each year, on the average, more than 490 million tons of sediment, 185 tons for each square mile of the conterminous United States, washes into the oceans. Fourteen million tons is discharged to the Atlantic Ocean, 378 million tons to the Gulf of Mexico, and 99 million tons to the Pacific Ocean. If this sediment were transported by train, it would fill an average of 27,000 boxcars per day. These figures underestimate the amount of soil that is eroded, because in many areas reservoirs and diversions may trap up to 75 to 95 percent of the sediment. However, it should also be kept in mind that there is a significant amount of sediment that occurs naturally and that is probably uncontrollable.

Despite the staggering size of these figures, it appears that the amount of sediment discharged to the oceans has lessened over the past years. No overall figures are available, but it would appear, for example, that the average annual suspended sediment discharge carried by the Mississippi River to the Gulf of Mexico has been reduced by about 30 percent during the past 100 years. The annual sediment discharge of the Colorado River has fallen from 234 million tons during 1911–16 to 152,000 tons during 1966–67. This dramatic reduction in the Colorado is due largely to the construction of reservoirs which trap the sediment and to diversion of more water for irrigation. Improved land use practices have also helped, but much of the sediment has simply been retained upstream rather than carried to the oceans. The reservoirs and irrigation, of course, may create or aggravate other problems, such as salinity.

It is not known whether it is better to have the sediment trapped behind dams or to have it flow to the oceans. Both situations are undesirable, and the key goal is to reduce the amount of sediment which gets into rivers in the first place. It appears that progress has been made in reaching this goal.

**Surface Mining**—Surface mining unaccompanied by reclamation has many serious environmental consequences. It can cause severe erosion, pollute water with acid drainage, cause aesthetic blight, and destroy land for other productive uses unless adequate reclamation is undertaken. In last year's Annual Report, we indicated that the acreage being surface mined in the United States is increasing rapidly. Current energy supply shortages and the rising demand for low sulfur coal to meet the 1975 deadline for Federal air quality standards make it likely that surface mining will grow at an even faster rate. About 75 percent of the country's economically strippable coal reserves lies in 13 states west of the Mississippi, and it is likely that large new western areas will be opened to mining.[39] How much will be reclaimed depends heavily on the effectiveness of regulation at all levels of government.

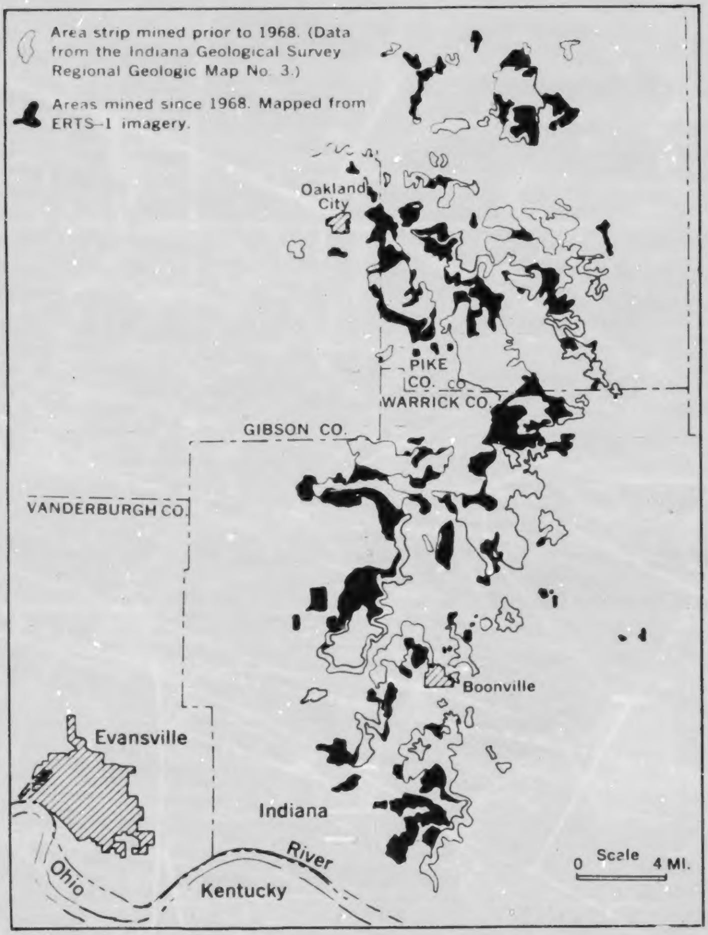
New monitoring technology should be a major help in the enforcement of surface mining laws and in keeping track of the problem. Figure 26 shows the rapid increase in surface mined area which has occurred in a portion of southern Indiana. It also shows the potentially great value of earth-orbiting satellites to monitor environmental problems. The map is based on pictures taken from the ERTS–1 satellite, which photographs the entire United States once every 18 days. Such satellites can be used for this type of comparatively small-area analysis as well as for the type of macroscale picture reproduced in Figure 19.

**Impervious Surfaces**—As urban development spreads, buildings, streets, and pavement cover land where water once percolated into the soil, rendering the urban surface increasingly impervious to rainfall. This means much faster and greater water runoff, which increases the likelihood of erosion and flooding. Impervious surfaces can reduce urban water supply by decreasing the flow of water to natural aquifers. They can also impair water quality by increasing the amount of water discharged directly into a stream without treatment.

In many urban areas, small creeks or rivers have become major flood hazards. Because so much of the land around them is covered with concrete, very little of the rain from a storm is absorbed into the ground. Instead, it is channeled directly into the river. Rock Creek in Washington, D.C., is a good example of this phenomenon. A study by the U.S. Geological Survey estimated that if 80 percent of an area is sewered and 60 percent is covered by impervious surfaces, the water runoff occurring in the average once-a-year flood will be more than four times greater than if none of the area were sewered or impervious.[40]

Figure 26

## Mined Land Inventory Map, Pike, Warrick, and Gibson Counties, Ind.


Area strip mined prior to 1968. (Data from the Indiana Geological Survey Regional Geologic Map No. 3.)
Areas mined since 1968. Mapped from ERTS–1 imagery.
Oakland City
PIKE CO.
WARRICK CO.
GIBSON CO.
VANDERBURGH CO.
Boonville
Evansville
Indiana
Ohio
River
Kentucky
0 Scale 4 MI.

Source: Earth Satellite Corporation and the Indiana Geological Survey, *Application of ERTS–A Imagery to Fracture Related Mine Safety Hazards in the Coal Mining Industry*, prepared for the National Aeronautics and Space Administration under contract #NAS5–21795

A combination of impervious surfaces and inadequately designed storm sewers can also cause local, intra-urban flooding. Although a serious problem, it has received little attention. Especially in older cities, such as Baltimore, more flood damage incidents occur from inadequate drainage within the city than from rivers overflowing their banks. Forty percent of the 800 reports to the Office of Civil Defense and Emergency Preparedness of damage from Hurricane Agnes and another major Baltimore flood in 1971 involved flooded basements where drains backed up, raw sewage collected, and property damage and health hazards resulted. The vast majority of the other 60 percent was connected with wind and rain water damage. There were few reports of damage caused by running water from streams.

One might think that newer suburban developments, because they are of lower density, would contain less impervious surface. However, a study of Riverside, Calif., indicates that this may not be the case. Almost 60 percent of the built-up land area in Riverside is paved or covered by buildings, and almost one-third of the built-up area is more than 90 percent impervious. Wider streets, more parking area, and lower and broader buildings more than compensate for the lower density.

Clearly many of the problems that we have discussed are closely interrelated. More impervious surface, for example, may make flood plain development more hazardous and may increase erosion. The three categories of problems—land availability, areas of critical environmental concern, and land use effects—interact with each other in numerous and complex ways. Their interactions reflect the complexity of land use problems and the difficulty of developing satisfactory land use indicators.

## Land Use Indicators

The discussion so far illustrates the importance of land use in determining environmental quality. But it also demonstrates the difficulty of establishing a set of national environmental land use indicators.

Land use policies, whether at the local, state, or Federal level, are designed to accommodate many conflicting and often poorly defined social goals. These include economic profit, suitable living conditions at reasonable prices, aesthetic and environmental improvement, and siting of necessary facilities such as roads, industry, and powerplants. Unlike air and water pollution programs, the goals of land use programs and policies do not lend themselves to simple description or to indicators for which the desired direction of change is obvious.

The context of land use conflicts and decisions is usually local or regional, not national. Construction of housing on agricultural land may be desirable in one city but not in another. Steep slopes or earthquake faults are problems for some regions of the country but not for others. Large parks may be a major factor in the environmental quality of Washington, D.C., but they are not what attracts people to midtown Manhattan. In addition, the basic regulatory authority over land use rests with state and local governments.

Yet it is possible to develop some indicators of land use and environmental quality. For uses such as unreclaimed surface-mined land and wetlands, simple acreage increases or decreases have meaning. Some land use problems will be reflected in other environmental indicators. For example, a significant increase in erosion may show up as increased water pollution from sediment. If automobile-related air pollutants increase despite emission controls, land use patterns must clearly be examined.

Some land use decisions, such as the siting of airports, powerplants, and deepwater ports, are becoming questions of national concern. The Federal Government owns about one-third of the land in the United States, and the use of this land will be determined by national policy. But the majority of land use decisions must be made in a local or regional context because both the costs and benefits of the decisions are primarily local or regional. Insofar as national indicators are developed, they will have to be aggregated from a series of local indicators.

Land use, for the most part, is simply the culmination of a large number of individual decisions about how to allocate space. But like the state of the economy, which is also a cumulation of many uncoordinated decisions, land use can be guided so that the outcome is more consistent with the public interest. If such guidance is to be effective, there must be agreement on what constitutes satisfactory land use before indicators can be developed to measure whether the use of land is being better regulated. While we have identified above certain areas for which national indicators would be appropriate, most measures or indicators will have to be developed and applied primarily by local, State, and regional authorities.

## Population

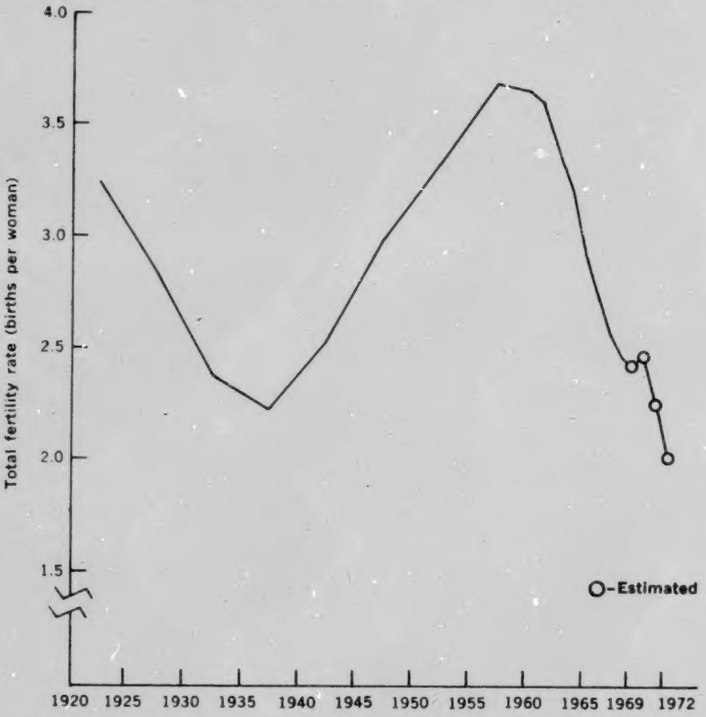
Population size is clearly one of the major factors underlying many environmental problems. Rapid growth in population provides impetus for growth in GNP and for the development of new technologies as well as increasing the demand on natural resources.

In 1972, for the first time in the Nation's history (see Figure 27), the total fertility rate (the number of births that a woman would have in her lifetime based on the birth rate occurring in a specified year) dropped below the replacement level (the level of fertility required for the population to replace itself exactly under projected mortality rates and in the absence of immigration). The total fertility rate was estimated at 2.0 in 1972, compared to the replacement level of 2.1.

The birth rate began to decline in the late 1950's. After leveling off in the 1968 to 1970 period, it has continued its sharp decline. This trend is most encouraging, but it must be kept in mind that the national birth rate has fluctuated sharply in the past. Thus, it cannot

Figure 27

### Total Fertility Rate, 5-Year Averages 1920–1959 and Single-Year Data 1960–1972



Source: Department of Commerce, Bureau of the Census, *Special Studies, Fertility Indicators: 1970*, Series P–23, No. 36, April 6, 1971, p. 9. Estimates for 1971 and 1972 from unpublished Bureau of the Census data

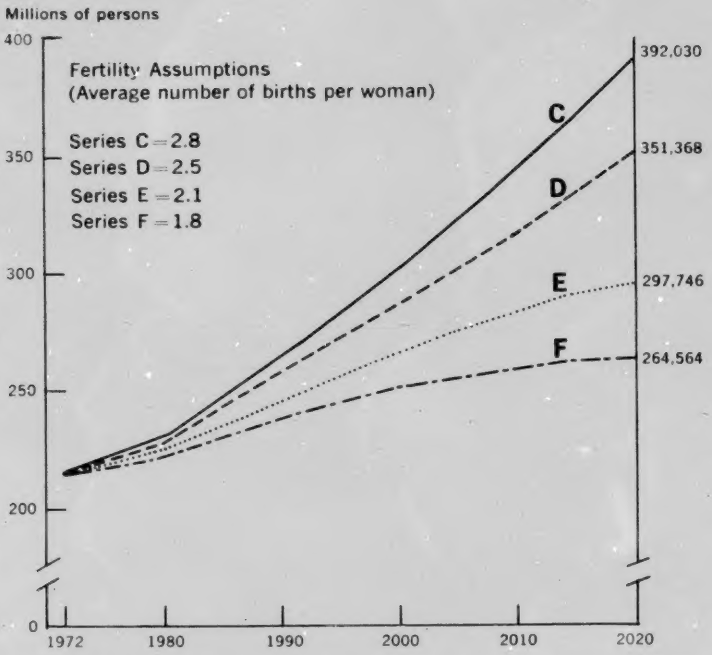
be predicted how long the current trend will continue.

Responding to the recent decline in fertility and to the sharp decline in the birth expectations of young wives, in December 1972 the Census Bureau issued revised projections of the U.S. population. The current U.S. population is estimated at 210 million. Previous projections had estimated the population level in 2020 at between 307 million and 447 million.[41] The new figures revise these estimates downward to a range of 264 million to 392 million by 2020 (see Figure 28).

Even with the current low birth rate, the U.S. population is increasing and is likely to continue to increase for several decades because of the proportionally large number of women of child-

Figure 28

## Projection of Total Population, 1972–2020



Source: Department of Commerce, Bureau of the Census, *Population Estimates and Projections*, Series P–25, No. 493, December 1972, p. 1

bearing age in the population. Assuming the lowest Census Bureau projection, there will be 40 million more people in the United States in 2000 than there are now.

Other industrialized nations are experiencing declines in the birth rate. But in many less-developed countries, which account for the bulk of the world's population, birth rates continue at high levels, often substantially negating hard-earned economic growth. At the current rate of growth, world population will double in less than 40 years. This will mean a staggering 4 billion additional people to feed, clothe, and shelter.

## Summary

At some time in the distant future it may be possible to aggregate all aspects of environmental quality and issue a definitive pronouncement that, for example, the quality of the environment improved 3.68 percent during the past year. Such a statement is not possible now, and, even if it were, it would not be very informative. The environment encompasses too many diverse aspects to make any single overall expression of quality meaningful.

Even within the discrete areas discussed in this chapter, generalizations are not easy. There are wide variations in the type and severity of problems among different geographical locations. For any one aspect of the environment, some problems may be lessening and others worsening. For example, the problem of water pollution from nitrates may be getting worse while water pollution from sediment may be showing improvement. There is also the question of relating environmental trends to baselines. Although there may be steady improvement in a particular aspect of the environment, the magnitude of the problem may still remain substantial. Conversely, there may be deterioration in some problem area; yet the quality of the environment may still be good.

In both air and water pollution, major obstacles still stand in the way of obtaining adequate data on national status and trends. But perhaps for the first time, there is good reason to expect that a thorough description of where the Nation stands with respect to pollution will soon be available.

The data presented in this chapter continue to lend support to the conclusion of the Council's 1972 Annual Report that air quality is improving. There has been a continuing decline in the levels of sulfur oxides, due to the use of lower sulfur content fuels. The automobile-related pollutants are also declining as cars with emission controls replace the older models.

Neither the Geological Survey data nor the other information in the water pollution section yet provides a basis for generalizing about water quality. Chapter 2 shows that dramatic improvements in water quality can take place, and the Willamette River is not unique. But the extent to which the Nation's waters have improved or degraded remains largely a question for speculation.

We have discussed a number of aspects of land use in the United States. The dominant trend is the "spread city." The pervasive influence of the automobile has led to urban areas which occupy increasing amounts of land at lower densities than any previous type of development. This is not to say that we are becoming a nation paved over with concrete. There is no national shortage of land—only an increasing shortage of the right kind of land in the right places. There are so many interrelationships between land use and the environment that they are almost inseparable concepts. We are beginning to have a greater appreciation and understanding of these interrelationships.

While progress has been made in describing, understanding, and improving the environment, there remain obvious gaps. There is still a long way to go before we can be satisfied with our effort. But our improved ability to describe and understand trends in the quality of the environment lays the groundwork for even more progress in achieving better environmental quality.

## Footnotes

1. A. B. Toan, Jr., "Social Measurement," *The New York Times,* Mar. 18, 1973, Sec. 8, p. 14, col. 3.
2. The Directory may be purchased at the Government Printing Office.
3. For a full description, see Lyndon R. Babcock, Jr., "A Combined Pollution Index for Measurement of Total Air Pollution," *Journal of the Air Pollution Control Association* 20:653–59, October 1970, and Lyndon R. Babcock, Jr., and Niren L. Nagda, "Cost-Effectiveness of Emission Control," *Journal of the Air Pollution Control Association* 23:173–79, March 1973.
4. These data will be published as part of the forthcoming EPA document, "The National Air Monitoring Program: A Status Report on Trends in Air Quality and Emissions." The document is being compiled by the EPA Office of Air Programs, Research Triangle Park, N.C.
5. See Thomas R. Hauser and Carl M. Shy, "Position Paper: $NO_x$ Measurement," *Environmental Science and Technology* 6:890–94, Oct. 1972, and EPA press release of the statement of William D. Ruckelshaus (EPA Administrator), April 11, 1973.
6. Ralph M. Rotty (Old Dominion University, Norfolk, Va.), "Global Production of $CO_2$ from Fossil Fuels and Possible Changes in the World's Climate," paper to be presented at the American Society of Mechanical Engineers, New Orleans, La., September 1973 (unpublished).
7. T. D. Steele, E. J. Gilroy, and R. O. Hawkinson, "A Nationwide Assessment of Areal and Temporal Variations in Quality, Using Selected Data from the National Stream Quality Accounting Network," U.S. Geological Survey Open File Report, 1973.
8. See Council on Environmental Quality, *Third Annual Report* (Washington: Government Printing Office, 1972), pp. 44–46.
9. The same kind of analysis has been used successfully in many academic studies, such as M. G. Wolman, "The Nation's Rivers," *Science* 174:905–918, Nov. 26, 1971, and in the detailed technical studies of rivers often performed prior to establishing standards and abatement plans for dischargers.
10. Environmental Protection Agency, Division of Water Planning, Office of Air and Water Programs, "Priority Basin Accomplishment Report," Feb. 28, 1973.
11. Most of the data in this section come from Great Lakes Basin Commission, Great Lakes Basin Framework Study, "Limnology of Lakes and Embayments," Draft 2, Vol. I, Appendix 4, December 1972. We are also indebted to the Great Lakes Basin Commission and Professor Alfred M. Beeton for their help in preparing this section of the report.
12. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, "Fish Larvae Found in Environment Contaminated with Oil and Plastic," MARMAP Red Flag Report No. 1, Jan. 18, 1973 (available from NOAA).
13. "NMFS Finds Tons of Plastic Debris on Alaskan Island," *NOAA Week* 4:1, Mar. 30, 1973.
14. P.L. 92–532, 86 Stat. 1052 (1972).
15. "Baseline Studies of Pollutants in the Marine Environment and Research Recommendations" (unpublished report available from the National

Science Foundation, International Decade of Ocean Exploration, May 1972).

16. Much of the material in this section is derived from two 1973 reports commissioned by the Council: Development Sciences, Inc., "Criteria for National Land Use Planning Indicators," and Earth Satellite Corporation, "Land Use Change and Environmental Quality in Urban Areas" (available from the National Technical Information Service, Springfield, Virginia 22151, PB–220 650 and PB–220 742).
17. Development Sciences, *supra* note 15.
18. See CEQ, *Third Annual Report, supra* note 8, at 24.
19. Robert C. Otte, "Competing Uses for Rural Land Near Cities" (unpublished paper from U.S. Department of Agriculture, Economic Research Service).
20. "Urban uses" are defined as all "urbanized areas" (as defined by the Census Bureau) plus "urban places" over 2,500 population not included in urbanized areas.
21. The Census Bureau's definition of an SMSA is "a county or group of contiguous counties (except in New England) which contains at least one central city of 50,000 inhabitants or more or 'twin cities' with a combined population of at least 50,000. Other contiguous counties are included in an SMSA if, according to certain criteria, they are essentially metropolitan in character and are socially and economically integrated with the central city. In New England, towns and cities are used in defining SMSA's." U.S. Department of Commerce, Bureau of the Census, *Statistical Abstract of the United States—1972* (Washington: Government Printing Office, 1972), p. 2.
22. Otte, *supra* note 18.
23. Density for all SMSA's in 1960 was 364 persons per square mile; in 1970, 360 persons per square mile. *1960 Census of Population,* Vol. 1, Part A, Table 34; *1970 Census of Population,* Vol. 1, Part A, Table 35.
24. U.S. Department of Commerce, Bureau of the Census, *Statistical Abstract of the United States—1972* (Washington: Government Printing Office, 1972), Table 15, p. 16.
25. *Id.*
26. U.S. Department of Agriculture, Economic Research Service, "1972 Changes in Farm Production and Efficiency," Statistical Bulletin No. 233 (Washington: Government Printing Office, 1972), Table 6, p. 10, and Table 7, p. 11.
27. *1972 OBERS Projections: Economic Activity in the United States,* Vol. I, *Concepts, Methodology, and Summary Data* (Washington: U.S. Water Resources Council, 1972). These figures exclude cropland not used for raising crops, such as cropland used for grazing.
28. U.S. Department of Agriculture, Economic Research Service, "1972 Changes in Farm Production and Efficiency," Statistical Bulletin No. 233 (Washington: Government Printing Office, 1972); 1972 figure, unpublished Economic Research Service information.
29. Earth Satellite, *supra* note 15.
30. Communication from U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, April 23, 1973.
31. S. P. Shaw and C. G. Fredline, "Wetlands of the United States, Their Extent and Their Value to Waterfowl and Other Wildlife," U.S. Fish and Wildlife Service Circular No. 39 (Washington: Government Printing Office, 1956).
32. For an account of some of the effects of wetlands development in Hillsborough County, see John L. Taylor and Carl H. Saloman, "Some Effects of Hydraulic Dredging and Coastal Development in Boca Ciega Bay, Florida," *Fishery Bulletin* 67: 213, Spring 1969.

33. Gilbert F. White, "Changes in Urban Occupancy of Flood Plains in the United States" (University of Chicago, Department of Geography, unpublished Research Paper 57, 1957).

34. U.S. Water Resources Council, "First National Assessment of the Nation's Water Resources" (Washington: Water Resources Council, 1968), p. 5–2–6.

35. The examples are from A. A. Klingebiel, "Costs and Returns of Soil Surveys," *Soil Conservation* 32:3–6, Aug. 1966.

36. U.S. Department of Agriculture, Soil Conservation Service, unpublished data based on "National Inventory of Soil and Water Conservation Needs," 1967.

37. U.S. Department of Agriculture, Soil Conservation Service, unpublished data, 1973.

38. W. F. Curtis et al., "Fluvial-Sediment Discharge to the Oceans from the Conterminous United States," Geological Survey Circular 670 (Washington: Government Printing Office, 1973).

39. U.S. Department of the Interior, U.S. Geological Survey, "Stripping Coal Resources of the United States—January 1, 1970," U.S. Geological Survey Bulletin No. 1322 (Washington: Government Printing Office, 1970).

40. L. B. Leopold, "Hydrology for Urban Planning—A Guidebook on the Hydrologic Effects of Urban Land Use," U.S. Geological Survey Circular 554 (Washington: Government Printing Office, 1968).

41. See U.S. Department of Commerce, Bureau of the Census, "Population Estimates and Projections," Series P–25, No. 470, November 1971, p. 1.

**Appendix**

## Percentage of 1971 Total Air Pollution Emissions, by Source and by Pollutant, Unadjusted and Adjusted for Effects[1]

| Source | CO | | Particulates | | $SO_2$ | | HC | | $NO_x$ | | Total[2] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unadj. | Adj. | Unadj. | Adj. | Unadj. | Adj. | Unadj. | Adj. | Unadj. | Adj. | Unadj. | Adj. |
| Transportation | 37.2 | 2.5 | 0.5 | 1.7 | 0.5 | 1.0 | 7.1 | 5.6 | 5.4 | 8.5 | 50.7 | 19.3 |
| Fuel combustion in stationary sources | .5 | 0 | 3.1 | 11.0 | 12.6 | 25.6 | .1 | .4 | 4.9 | 3.8 | 21.2 | 40.8 |
| Industrial processes | 5.5 | .4 | 6.5 | 23.1 | 2.5 | 5.0 | 2.7 | .1 | .1 | .2 | 17.3 | 28.8 |
| Solid waste disposal | 1.8 | .1 | .3 | 1.2 | 0 | .1 | .5 | .1 | .1 | .2 | 2.7 | 1.7 |
| Miscellaneous | 3.1 | .2 | 2.5 | 8.8 | 0 | .1 | 2.4 | .1 | .1 | .2 | 8.1 | 9.4 |
| **Total**[2] | **48.1** | **3.2** | **12.9** | **45.8** | **15.6** | **31.8** | **12.8** | **6.3** | **10.6** | **12.9** | **100.0** | **100.0** |

Source: Table 1, Lyndon R. Babcock, Jr., and Niren L. Nagda, University of Illinois

---

[1] See text for explanation of adjustment for effects.

[2] Totals may not add due to rounding.

## CHAPTER 7

# International Action to Protect the Environment

The late 1960's and early 1970's marked a major turning point in the priority of the environment on the international scene. Before then, environmental protection received little attention in the domestic programs and international relations of most nations. Within national governments, those environmental programs which existed were generally insubstantial and unfocused. International cooperation was a rarity, and agreements between nations to address shared environmental problems were unknown. At the United Nations, speeches were occasionally delivered on environmental issues, but little was being done.

As one decade moved into another, however, there was an explosion of environmental interest and activity in a number of nations, particularly the United States. This spilled over national borders and cut across ideologies, reaching around the globe and elevating the environment to a position of worldwide concern. Protection of environmental quality is now a priority matter in relations among the nations of the world.

This chapter reviews international environmental accomplishments of the past year in an historical perspective. The first sections discuss protection of the ocean, control of transboundary pollution, and preservation of the world's wildlife and unique natural areas. Pollution control in 10 industrial nations and the international trade effects of pollution control are discussed next. The chapter concludes with a survey of international cooperation in solving common environmental problems.

## Protecting the Oceans

When William Cullen Bryant spoke of "old ocean's gray and melancholy waste," he unwittingly foretold the spectacle that is common on the oceans today. In the late 1960's, major oil spills from tanker collisions—such as the *Torrey Canyon* in 1967 and the *Ocean Eagle* in 1968—and the oil leak from offshore drilling at Santa Barbara in 1969 dramatized the threat of oil pollution. Crossing the Atlantic in his papyrus vessel *Ra,* Thor Heyerdahl reported pollution hundreds of miles from land. His report confirmed growing fears that ocean pollution had spread well beyond coastal areas. This past year, a research vessel of the National Oceanic and Atmospheric Administration (NOAA) encountered extensive oil and plastic pollution in the Atlantic.[1]

The oceans, in contrast to the land masses of our globe, are truly international. No nation exercises sovereignty over them, and no nation, acting alone, can protect them from pollution and other environmental insults. This section discusses international efforts to protect the oceans—from oil pollution, from ocean dumping of wastes, and from land-based air and water pollution. It also describes the environmental considerations to be addressed at the 1974 conference on the Law of the Sea.

### Oil Pollution

One might assume that worldwide concern over marine oil pollution is a relatively recent phenomenon. In fact, however, concern about oil in the marine environment began in the early years of the 20th century although only in recent decades have international agreements been achieved.

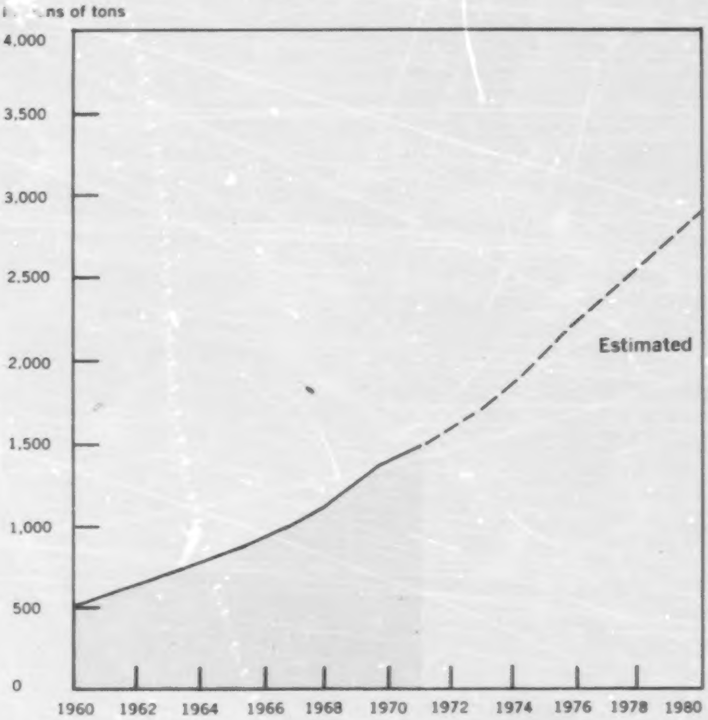
The oil tanker *Ocean Eagle* breaks up at sea.

**Early Oil Pollution Controls**—By the mid-1920's, many nations, including the United States, prohibited oil discharges in their ports. Public indignation over fouling of our shorelines was so high that in 1922 the Congress requested the President to bring the maritime nations together for a conference on preventing oil pollution.[2] The conference met in 1926, but the resulting convention never took effect.

Early efforts were focused on preventing "intentional" discharges—that is, the discharge of oily water mixtures during such routine operations as bilge pumping and cleaning and deballasting cargo and fuel tanks. Recent estimates confirm that such operations cause more pollution than accidents. Approximately 1.5 million metric tons of oil enters the oceans from bilge pumping, tank cleaning, and ballast discharges each year, compared to 250,000 metric tons from vessel accidents.[3]

**Figure 1**

**Annual Growth of Oil Transport by Sea**



Source: Exxon, *Safer Tankers and Cleaner Seas* (New York: Exxon Corporation, 1972), p. 24

From the ill-fated 1926 convention through World War II, there was virtually no international activity to combat vessel pollution. However, increased sea transport of oil after World War II reawakened interest in controlling oil discharges (see Figure 1).

**The 1954 Convention**—A 32-nation conference in 1954 produced the International Convention for the Prevention of Pollution of the Sea by Oil.[4] Although the Convention was clearly an environmentally protective instrument, its basis was hardly "ecological" in today's terms. Most nations recognized oil as a problem only to the extent that it visibly dirtied the waters, fouled beaches, and coated birds and other marine animals. Oil's impact on the biological productivity of marine ecosystems was largely ignored. Thus the Convention's definition of oil included only the persistent oils such as crude and residual fuel oil. It did not cover refined petroleum products. The tendency to consider only the amenities of oil pollution continues to some extent today in spite of growing scientific evidence that the lighter products are more toxic than the persistent oils.

The Convention barred oil discharges exceeding 100 parts per million within 50 miles of land from tankers and "as far as practicable from land" from other ships but placed no limits on oil discharges beyond 50 miles. It required ships to maintain "oil record books" to help port inspectors keep track of oil cargoes. The Convention prescribed that ships be fitted with devices to separate oil and water discharged from bilges. It also required contracting nations to provide port facilities to receive oily ballast and tank cleaning residues.

Retreating from its 1926 leadership position, the United States opposed parts of the Convention as impractical and unrealistic. We did not ratify it until 1961, and then only with a number of reservations.[5]

**Efforts since 1954**—In 1958 the Inter-Governmental Maritime Consultative Organization (IMCO), a specialized agency of the United Nations, was established, and, in 1962, a second London conference, this time under IMCO's auspices, strengthened the 1954 Convention by extending the 50-mile prohibited zone to 100 miles in most cases. The separator and reception facility requirements were deleted on the basis of their economic and technological impracticality.[6]

The 1954 Convention and its 1962 amendments relied on prohibited zones and performance standards for tanker operations to prevent intentional oil pollution. Neither attempted to prevent pollution by changing tanker design and construction in order to eliminate the need to pump ballast water into fuel or oil cargo tanks. Nor did they deal with ways to prevent spills from vessel accidents.

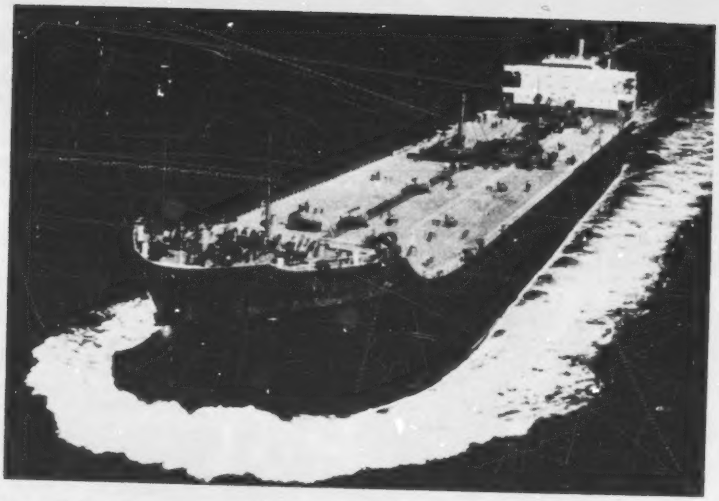
Another London conference was held in 1969. The resulting amendments continued to focus on intentional pollution. They further tightened the discharge limitations, prohibiting all tanker discharges within 50 miles of land and adding further restrictions on discharges beyond 50 miles. The definition of oil was still limited to the persistent oils.[7]

That same year—just 2 years after the *Torrey Canyon* disaster—IMCO first responded to oil pollution caused by casualties. The response was indirect, aimed not at preventing the casualties but at compensating victims of oil pollution and establishing a legal basis for nations to take action to prevent oil pollution to their shores from damaged tankers outside territorial waters. The results were the International Convention on Civil Liability for Oil Pollution Damage and the International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties. Neither is yet in force. The President has submitted both the conventions to the Senate for its consent and the implementing legislation to the full Congress for enactment.[8] Thus far, the only Congressional action is Senate approval of the Intervention Convention.

The Liability Convention was supplemented in 1971 by a new convention to establish an international fund to compensate for oil pollution damage.[9] Also in 1971, the first steps were taken to prevent oil pollution by establishing tanker design and construction standards.[10] Amendments to the 1954 Oil Pollution Convention require that new tankers be designed so that the amount of oil spilled as the result of a grounding or collision is limited.

**The 1973 IMCO Conference**—As early as 1962 the international community set an ultimate goal of eliminating all intentional discharges of oil into the oceans.[11] The U.S. Secretary of Transportation, speaking to NATO's Committee on the Challenges of Modern Society (CCMS) in 1970, urged that the intentional discharge of oil be eliminated by 1975, or by the end of the decade at the latest. IMCO's Conference on Marine Pollution this October will be devoted to preparing a convention based on that goal. Increases in oil pollution and growing evidence of its adverse effects, even in small concentrations, together with the development of new tanker technology, have stimulated a renewed commitment to achieving the no-discharge goal.

IMCO subcommittees have been preparing for the conference for more than 2 years. In an effort to assure a convention that avoids past deficiencies, U.S. negotiators have advanced five preliminary suggestions on major issues. The first is to expand the definition of oil to include all petroleum products. The second is to place further restrictions on intentional discharges. The third is to establish mandatory design and construction requirements for new ships, including segregated ballast so that oily cargo tanks are not routinely filled with ballast water.



The 1973 IMCO conference will consider additional design safeguards for supertankers to help prevent oil pollution.

Fourth, the United States has urged that new tankers be constructed with double bottoms to minimize the spillage of oil after groundings. Fifth, the United States has urged that effective enforcement provisions be developed. In particular, it has recommended that a visible sheen on the water be considered a presumption that a vessel has violated the performance standards of the convention unless the operator can prove that he has met all standards. The United States has also proposed that any nation into whose ports an offending tanker sails should be required to bring enforcement proceedings. Currently, only the nation under whose flag a tanker sails can take enforcement action.

Although oil attracts the most attention, IMCO has also recognized other pollution problems caused by vessels. The 1973 conference will consider performance and construction standards to prevent pollution from other hazardous substances and from ship-generated sewage and garbage. Both of these types of pollution have been subject to controls in U.S. coastal waters under laws enacted in 1970 and 1972.[12] Further, the United States proposes that the draft convention facilitate amendments by future conferences to cover new pollution problems in the marine environment.

In a June 5 address before the IMCO Council, the Chairman of CEQ proposed that IMCO be given new authority to function as the international agency with standard-setting responsibilities for marine pollution from vessels, including ocean dumping. Under this proposal, individual nations would continue to enforce international conventions on vessel pollution, but a new committee within IMCO would be given authority to adopt and revise the detailed regulations needed to implement conventions, subject to the disapproval of member nations. At present, these detailed regulations can be adopted only through a cumbersome amendment procedure. The proposed new committee would also coordinate and administer all of IMCO's marine pollution activities, including cooperation with other international organizations and technical advice to member nations.[13]

Much remains to be done to bring existing conventions into effect and to realize the ambitious and important goals of the 1973 IMCO conference. But vessel technology to reduce both intentional and accidental discharges is largely available. And growing evidence of widespread ocean pollution—such as the floating "tar balls" and plastic particles caught in the nets of U.S. Government research vessels last year—underlies the urgency of the measures being considered.

## Ocean Dumping

Using the oceans as a dumping ground is an old practice that has grown in recent years. Ocean dumping is not a major contributor to total marine pollution when compared to the pollution caused by land-based air pollution sources, polluted rivers, and vessel traffic. But the fact that dumping has been concentrated in a limited number of coastal sites such as the New York Bight intensifies the potential for harm.[14] Furthermore, as nations develop stronger controls on air and water pollution, there is concern that wastes formerly discharged into the air and water might be dumped into the ocean. CEQ articulated this concern in its 1970 report, *Ocean Dumping—A National Policy*.

As a result of that report, the President proposed ocean dumping legislation in 1971, and it became law in October 1972. The new Marine Protection, Research and Sanctuaries Act requires a permit from the Environmental Protection Agency for all dumping in U.S. waters and the contiguous zone and dumping of material transported from the United States anywhere in the oceans.[15] This law is discussed further in Chapter 5, Perspectives on Environmental Programs.

In November 1972, at a conference in London attended by 80 participating and 12 observer nations, an international ocean dumping convention was adopted. Similar to the U.S. legislation, the convention has been submitted to the U.S. Senate and similar bodies in other nations for consent to ratification. It will take effect when it has been ratified by 15 nations.[16]

Under the convention, nations agree to regulate all ocean dumping through national administrative authorities. No dumping is allowed without a permit. All dumping of extremely hazardous substances is prohibited except in an emergency. Dumping of other hazardous substances is only allowed pursuant to a special permit issued by the national authority. Other materials may be dumped pursuant to a general permit granted after specified criteria have been met.

The convention requires each contracting nation to regulate the dumping of all material loaded in its ports for the purposes of being dumped at sea or loaded on a vessel or aircraft of its flag or registry in the territory of a nation not a party to the convention. Participating nations are further required to maintain records concerning the nature and quantities of materials which they permit to be dumped and the circumstances of such dumping. They must report this information periodically to an international organization to be established for administration of the convention.

In February 1972, 12 European nations anticipated the international agreement by entering into the Oslo Convention, which controls ocean dumping in the Northeast Atlantic and North Sea. The Oslo Convention is nearly identical to the ocean dumping convention.

## Domestic Air and Water Pollution

Without doubt, some of the most difficult efforts to preserve the world's oceans still lie in the future. Although the conventions to control oil pollution and ocean dumping are important, they do not address two major contributors to marine pollution—air and water pollution from land-based sources.

There is little precedent for cooperative international action to limit land-based pollution of the oceans. Indeed, the only available model is the U.S.-Canadian Great Lakes Water Quality Agreement.[17] Progress under the Agreement is discussed later in this chapter. Political, economic, and jurisdictional questions are likely to make such cooperation to clean up the oceans difficult. Some nations are reluctant to admit that they cause substantial pollution. Some fear that controls may put their industries at a competitive disadvantage. In recent years, the geographical extent of coastal state jurisdiction in the oceans has been a major issue.

Nevertheless, pursuant to sections 7 and 101(c) of the Federal Water Pollution Control Act Amendments of 1972,[18] the United States will seek international agreement on measures to control land-based sources of marine pollution. From the standpoint of existing knowledge, the first priority for control should be those pollutants that do not degrade in the oceans but disperse widely and accumulate in food chains, such as persistent pesticides and PCB's. These pollutants threaten marine organisms and ultimately man himself. Recent U.S. actions—by the Government in terminating the use of DDT and by private industry in voluntarily curtailing the manufacture of PCB's—have set good examples.

## Law of the Sea Conference

International law governing national rights and responsibilities with respect to the oceans and the seabeds rests in large measure on the 1958 Geneva Conventions on the Territorial Sea and the Contiguous Zone,[19] on the High Seas,[20] and on Fishing and Conservation of the Living Resources of the High Seas.[21] However, these Conventions did not resolve the question of the breadth of the territorial sea or the precise outer limit of the continental shelf. At a subsequent conference in 1960, a U.S. compromise proposal of a 6-mile territorial sea and an additional 6-mile exclusive fishery zone failed by one vote to obtain the necessary two-thirds majority. The United States has consequently adhered to the traditional position of a 3-mile territorial sea. We have also accepted a 12-mile exclusive fisheries zone in accordance with international practice, but we do not recognize coastal state jurisdiction over fisheries beyond 12 miles.

Because the 1958 Conventions do not precisely limit national jurisdiction in the oceans, some coastal nations claim broad territorial jurisdiction—up to 200 miles—either generally or for pollution control, mineral exploitation, or fishing.[22]

The U.N. General Assembly in 1970 called for a Law of the Sea Conference to stabilize international rules governing national rights in the oceans and, particularly, to establish a regime for mineral exploration and exploitation of the seabeds. The Conference will begin with an organizational session in New York in October 1973. Substantive negotiations will begin in Santiago, Chile, in the spring of 1974. In its preparatory meetings, the Seabeds Committee established a subcommittee on marine pollution, to which several nations have submitted draft treaty articles. The subcommittee has had preliminary discussions on a wide range of legal issues concerning marine pollution—the basic obligations and powers of states, jurisdictional and enforcement issues, and liability for pollution damage.

## Transboundary Pollution

It is a truism that pollution does not respect national boundaries. The geographical situation of the United States may lead us to underestimate how significant this fact is in certain parts of the world. When several nations are located in close proximity, the problem of pollution crossing national boundaries becomes serious. Europe, which faces some of the most severe pollution problems, may aptly be compared with the industrialized Northeastern United States. Both have rivers that meander by or through three or four jurisdictions, clusters of air pollution sources that straddle several jurisdictions or produce emissions that are transported beyond jurisdictional limits, and solid wastes that sometimes need to be transported from one jurisdiction to another for disposal. Whereas in the United States the Federal Government has authority to set common standards and assist the states in developing complementary policies and programs, in Europe no comparable coordinating authority exists.

The Declaration on the Human Environment, adopted at the 1972 U.N. Conference in Stockholm, contains two principles which speak directly to the problem of transboundary pollution. Principle 21 provides that nations have "the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction." Principle 22 provides that when such damage does occur, "States shall cooperate to develop further the international law regarding liability and compensation for the victims of pollution and other environmental damage caused by activities within the jurisdiction or control of such states to areas beyond their jurisdiction." [23]

## The United States and Canada

The U.S.-Canadian Great Lakes Water Quality Agreement, signed by President Nixon and Prime Minister Trudeau on April 15, 1972, was described in the Council's Third Annual Report. It commits both countries to achieve general and specific water quality objectives and requires that specified pollution abatement measures and programs be either completed or initiated by Dec. 31, 1975. Pri-

Canada and the United States are cooperating to clean up Lake Huron and the other Great Lakes.

ority is being given to reducing phosphate loadings—from municipal treatment plants, industries, and land runoff—which contribute to eutrophication, most noticeably in Lake Erie.

Since the agreement was signed, both Nations have taken actions to carry out its provisions. On the U.S. side, almost all the significant municipal waste water treatment facilities at which phosphorus removal is required either are under construction or will soon receive construction grants from EPA. As of June, 32 projects in the Great Lakes basin have received about $224 million in Federal funds, and over 200 additional projects are expected to be funded within the next year at an estimated cost of nearly $750 million.[24]

Working together in the International Joint Commission (IJC), the United States and Canada have established the Great Lakes Water Quality Board and the Research Advisory Board called for in the agreement. The Boards have set up working groups to consider such specific problems as phosphorus loadings, land drainage, and dredge spoils disposal.

Canada expects that phosphorus removal facilities will soon be in place at all treatment plants on its side of Lake Erie, and construction of treatment plants in other parts of the Great Lakes basin is reporedly ahead of schedule. There is every reason to believe that the quality of the Great Lakes will be appreciably improved by the bilateral programs now underway.

Our two nations have also been cooperating on other transborder problems. Oil spill contingency plans have been developed for boundary waters on the Atlantic and Pacific coasts and in the Great Lakes, and joint studies of ecological conditions in the Puget Sound area are being planned. Under the auspices of NATO's CCMS, both countries are working to reduce pollution in the St. John River basin between Maine and New Brunswick. Air pollution problems in the Detroit-Windsor and Port Huron-Sarnia areas are being addressed by U.S. and Canadian officials at the Federal, state and provincial, and city levels. The two Nations are jointly monitoring water quality in the Red, Rainy, and St. Croix Rivers under the IJC.

## Controlling Salinity in the Colorado River

Following the communique issued in June 1972 with Mexican President Echeverria,[25] President Nixon named a Special Representative to investigate the problem of Colorado River salinity, discussed in last year's report, in order to recommend a definitive solution to the Government of Mexico. In May 1973, the Secretary of State presented the Special Representative's proposal to the Mexican Government, and negotiations between the two governments began in June 1973.

### European Problems

In Western Europe the problems of transboundary pollution are particularly acute because the countries are densely populated and heavily industrialized. They share both airsheds and major river basins, particularly the Rhine and the Danube.

Because of the many difficult legal, economic, and political problems presented by transboundary pollution in Western Europe, progress has been slow. Only relatively modest remedial efforts are yet underway. The Environment Committee of the Organization for Economic Cooperation and Development (OECD), for example, is studying the major issues involved in controlling transboundary pollution, particularly cost-sharing and other economic aspects.

The U.N. Economic Commission for Europe (ECE) also plans to address transboundary pollution. At its first meeting in Geneva last April, a new ECE group, the Senior Advisers to ECE Governments on Environmental Problems, agreed to consider possibilities for solving transboundary pollution problems in the Black Sea, shared by the USSR, Turkey, Rumania, Bulgaria, and Greece. Although this is a limited step, it could be the beginning of important efforts.

In Western Europe, action is underway to deal with pollution of the Rhine. The first ministerial-level conference of the International Commission for Protection of the Rhine Against Pollution was held at The Hague in October 1972. Delegates from the Federal Republic of Germany, France, Luxembourg, The Netherlands, and Switzerland agreed on a number of measures to combat salinity and chemical and thermal pollution. A second meeting is scheduled for fall 1973.

In October 1972 the Government of Finland invited nations bordering the Baltic Sea to join in a conference on preventing pollution in the Baltic. Because it is relatively shallow—an average depth of about 165 feet—the Baltic is sensitive to even relatively small amounts of pollution. Eutrophication introduction of toxic chemicals into food chains, and increasing numbers of oil spills are serious water quality problems in the Baltic. They can only worsen unless the nations most directly involved take action.

It is still not clear how European nations will ultimately control transboundary pollution. With the analogy to the Northeastern United States in mind, it is encouraging to note moves currently underway in Europe to establish pollution control mechanisms on a regional basis.

## Preserving the World's Natural Heritage

Private and national efforts to protect the world's wildlife and natural areas date far back into history, but it is only within the present century that these efforts have become international. The past year has seen dramatic advances in these international efforts, and this section describes these steps. A brief review of preceding action—or inaction—seeks to put these developments in historical perspective.[26]

## Early Efforts

Man set the stage for the extermination of plant and animal species when he became able to change his own environment. This point in man's development was reached far back in time. Even prehistoric men, who were hunters and used fire extensively, exerted considerable influence on plant and animal populations. The rate of extermination has increased dramatically in recent years. From the time of Christ to 1800, roughly one species of mammal was exterminated each 55 years. Now the rate is over one per year. Nearly 60 percent of all recorded exterminations of mammals has occurred in the 20th century.[27] Less complete information implies a similar record for other forms of animal life and for plants.

Man is responsible for most wildlife exterminations[28] either by outright killing of the animals or plants or by changing their habitats. The expansion of human population—with attendant changes in urbanization, agriculture, lumbering, transportation systems, pollution, and modern technology—constantly alters the face of the earth in subtle and not so subtle ways.

The implication of man's impact on his own environment was realized hundreds of years ago. In the 4th century B.C., Plato spoke of the denuded hills of Attica and losses of land, soils, water, timber, and crops.[29] Man's impact on wild animals and plants was appreciated early in history also. As early as the 3d century B.C., India realized the need for complete protection of some areas and animals.[30]

History records numerous efforts by rulers and governments to protect particular areas and forms of wildlife. The motives for these efforts were generally economic, but scientific, aesthetic, and recreational interests were also involved. Many areas were set aside by rulers to preserve wildlife for their own viewing or hunting. Men have also collected unfamiliar plants and animals—especially exotic species—that they found interesting and attractive. Collections existed in ancient Babylonia, China, Egypt, and Rome. With the development of science, botanical and zoological gardens were established, and rare and endangered species were collected for study. Until national scientific academies and institutions developed, most collecting was under the patronage of individual princes rather than governments.

Sometimes plants and animals have survived in special collections even after their extermination in the wild. Thus we have the ginkgo tree and the Pere David or Milu deer. Wild populations of these species were totally exterminated and those living today all come from specimens protected in private collections. The ginkgo tree, once widely distributed throughout the Northern Hemisphere, survived under cultivation in China and Japan, from where it was later reintroduced into Europe and brought to America. The Milu, an unusual deer, was found in modern times only within the Imperial Hunting Park of the Manchu Dynasty near Peking. Through negotiations with the Chinese imperial government, specimens of the deer were sent to the London Zoological Society in 1869 and 1883. Later the Duke of Bedford brought a number of them to his Woburn Abbey estate. His efforts probably saved the species. In 1895 many of those in the Imperial Hunting Park were eaten by starving peasants whose crops had been destroyed by a flood. The deer remaining were killed in 1900 by the armies that invaded Peking to suppress the Boxer Rebellion.

## The 20th Century

In spite of early sporadic action to share wildlife species among nations, there were no significant international agreements to protect wildlife until this century. Prior to the Convention on International Trade in Endangered Species of Wild Fauna and Flora concluded this year,[31] most wildlife agreements protected migratory wildlife only from commercial or sport hunting. Although early measures to transport and collect unusual species stemmed largely from scientific interest, the early agreements were basically motivated by economics—for example, the Convention Concerning the Conservation of Birds Useful to Agriculture, signed by 11 nations in Paris in 1902.[32]

Wild animals are preserved in Africa's Ngorongoro Crater.

Or they were motivated largely by sport hunting interests—for example, the 1916 U.S.-Canadian Treaty for the Protection of Migratory Birds.[33]

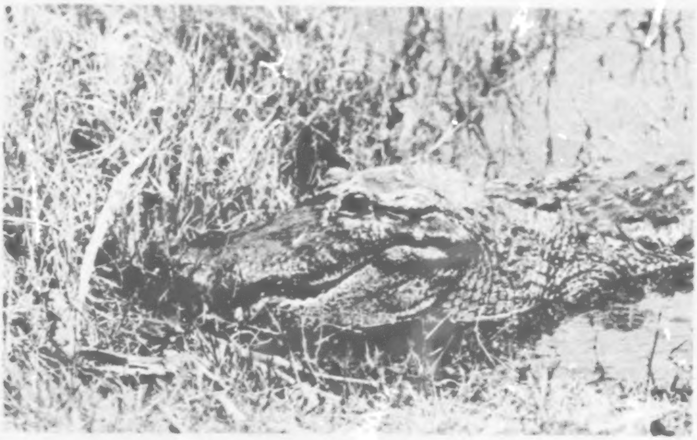
A distinctly environmental concern perhaps first appeared on an international scale in the 1930's. The 1935 African Convention Relative to the Preservation of Flora and Fauna in Their Natural State[34] prohibited hunting and harassment of wildlife and provided for protection of habitat. The Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere[35] was negotiated among member nations of the Pan American Union and took effect in 1942.

In 1948, the International Union for the Conservation of Nature and Natural Resources was established. Now composed of representatives of 30 national governments and several hundred government and private organizations from 84 nations, the IUCN was the first international organization devoted solely to environmental protection, especially wildlife conservation and parks.

During the next 20 years, a number of international conferences on wildlife took place.

**Endangered Species Convention**—The IUCN, in its 1963 meeting in Nairobi, agreed to develop a treaty to protect endangered species against threats caused by international trade. Drafts were circulated in 1965 and 1969. In the 1969 Endangered Species Conservation Act,[36] the U.S. Congress called for an international ministerial meeting to conclude a convention on endangered species. In addition, the 1972 Stockholm Conference recommended convening a conference as soon as possible to adopt such a convention.

The conference was held in Washington, D.C., from Feb. 12 through March 2, 1973, at the invitation of the U.S. Government. It



The alligator is endangered because of the commercial value of its hide.

climaxed efforts begun a decade earlier. Representatives of 80 governments participated, and there were observer delegations from 8 other nations and several international organizations.

The primary threat to many species of wild animals and plants is destruction of their natural habitat. The greatest danger to many others, however, is extermination caused by demands of international trade. This trade supplies animals for trophies and for skins—those of spotted cats and crocodiles, for example—and live animals for pets, public display, and medical research. Often the price paid is so high that the nation to which an animal is native is unable to control its exploitation. In earlier years, as discussed above, the extermination by trade of many wildlife species caused little international concern. The situation has changed, and nations are abandoning or modifying the priority that they once accorded wildlife hunting and trading interests.

The new Convention on International Trade in Endangered Species of Wild Fauna and Flora,[37] designed to preserve wildlife, has several features unprecedented in previous agreements. Membership is open to all nations, whether producers or consumers of wildlife, wishing to reduce the impact of international trade on endangered species. It protects over 500 species of animals and over 20,000 species of plants—whether from land or sea.

This Convention for the first time provides a means to protect wildlife against unregulated exploitation through international trade. Some months will probably pass, however, before the Convention is ratified by the 10 nations necessary for it to become effective. Many additional months may elapse before a sufficient number of nations have ratified it to make it effective. Until then it is possible that the species lists appended to the Convention could be used as shopping lists of endangered animals and plants. The knowledge that these species are soon to be controlled, together with the "grandfather" clause exempting specimens taken before the Convention comes into force, could sharply increase demand and accompanying prices. Early ratification of the Convention can alleviate this problem.

**Whales**—A major focus of recent marine mammal protection is the whale. Some species of whales are in danger of extermination. Unfortunately, recent international protective efforts and the strong U.S. actions that preceded these efforts had little historical precedent. Past international actions had focused largely, and not very successfully, on protecting whales as a commercial resource, not as an inherently valuable part of the marine ecosystem.

The decimation of whale populations is the product of a century and a half of overexploitation.[38] The first step toward regulation was taken in 1929 when, after a precipitous decline in the North Atlantic whale population, the International Bureau of Whaling Statistics was established in Norway. It encouraged whaling nations to submit data on their activities. In 1931, the Convention for the

The United States has proposed a 10-year moratorium on commercial whale hunting.

Regulation of Whaling [39] was signed as a result of League of Nations efforts. The agreement imposed few restrictions on the signatories, limiting only destructive and wasteful methods of operation—for example, the taking of very young whales and females with new offspring. Although the agreement was virtually unenforceable, Japan and Russia—two major whaling nations—did not ratify it.

A supplemental agreement signed in 1937 by nine governments called for at least one government inspector on each factory ship. It closed areas of the Atlantic, Pacific, and Indian Oceans to hunting species, prescribed minimum lengths for certain species, and established a whaling season.

Near the end of World War II, a majority of the parties to the 1937 agreement established the so-called Blue Whale Unit to regulate the maximum take of whales per season. Unfortunately, because this unit of measurement was scientifically unsound, it legitimized indiscriminate reduction of all species.

Following the war, a new international whaling conference was held in Washington at U.S. initiative. It established the International Whaling Commission (IWC). The IWC was authorized to administer regulations for open and closed waters and for the periods, methods, and intensity of whaling, including the maximum catch in any one season. But the IWC had no power to restrict the number or nationality of factory ships and onshore whaling stations or to allocate specific quotas to any one nation. Moreover, weak as the agreements were, they were undermined by widespread violation and ineffective self-enforcement.

Commercial interests long dominated both the hunting of whales and the decisions of the IWC. But in the last few years, U.S. actions in response to conservationists have stimulated a change. In 1970, the United States placed eight species of commercially hunted whales on the endangered species list,[40] thus banning the import of whale products and thereby eliminating about 20 percent of world demand. At the end of 1971, the last U.S. whaling license was cancelled. In 1972, the Marine Mammal Protection Act was passed.[41] It is the first wildlife protection law whose prime objective is the health and stability of an ecosystem. It establishes strict controls over the taking of marine mammals for any purpose and over the import of their parts and products.

Internationally, the U.N. Conference on the Human Environment in Stockholm in 1972 overwhelmingly passed a recommendation introduced by the United States to strengthen the International Whaling Commission and to impose a 10-year moratorium on commercial whaling. Following the Stockholm Conference, the U.S. delegation to IWC, led by the Chairman of CEQ, urged the adoption of the 10-year moratorium on all whaling. Despite strenuous efforts by the United States, the Commission refused to agree to the moratorium or to open the meeting to the press. The IWC did agree to several conservation measures, including reductions of up to 38 percent in the 1973 quotas for certain species. It extended the ban on humpback and blue whales and continued protection for several other endangered species. The IWC also agreed to expand its research budget, and Japan and Russia finally promised to permit international observers to check their compliance with IWC quotas and regulations.

At this June's IWC meeting, the United States again proposed a global 10-year moratorium on commercial whaling. Although seven other IWC member nations supported the moratorium, it once again failed to be approved. The IWC did agree to a 25 percent reduction in next year's quota for the Antarctic Fin whale, which is the most seriously depleted of the whales currently harvested, with a moratorium on all harvests of this whale in 3 years. Quotas for other Fin whales and for Sei, Sperm, and Minke whales were held at or slightly below last year's levels. The IWC, however, has no enforcement powers, and Japan and Russia may decide not to comply with its decisions.

The United States has pressed other international measures to protect whales. At the 1972 IWC meetings, the United States proposed that the International Whaling Commission set up a subcommittee to examine ways to strengthen scientific and statistical aspects of the IWC with an eye to incorporating conservation values into IWC decisions. In addition, the United States proposed that the IWC assume responsibility for all whales and related sea mammals, not just those that are harvested commercially, on the grounds that acquisition of data on stocks, distribution, and ecology of dolphins and porpoises is a legitimate objective of the Whaling Commission. Both U.S. proposals were accepted. During the past year, a subcommittee prepared specific recommendations which were presented to the June meeting of the IWC. Japan and Russia rejected any immediate implementation, and therefore the recommendations were indefinitely postponed.

Pursuant to the Marine Mammal Protection Act of 1972, the United States also prepared a redraft of the International Whaling Convention.[42] The thrust of the revision is to broaden the scope of IWC to embrace all facets of conservation and management and to recognize that marine mammals have aesthetic, recreational, nutritional, and economic values that contribute to the welfare of mankind. Another major aim of the redraft is to change management from the "maximum sustainable yield" concept to the more flexible "optimum population level" concept. The redraft has been submitted to the IWC.

In large part because of the forceful U.S. position during the past 2 years, most nations are coming to regard whales as a marine resource of the world rather than as an economic opportunity for those nations which exploit them. The crucial question is what future course the two major whaling nations, Japan and Russia, will chose to follow.

### Areas of Unique Value

Many unique areas have natural, historical, or cultural value for all the peoples of the world. There are the Grand Canyon, Angel Falls in Venezuela, Stonehenge in the United Kingdom, the pyramids of Egypt, and the Serengeti Plain of East Africa. Until 1972, preserving such areas received little formal international recognition.

The United States authorized the world's first national park, Yellowstone, in 1872.[43] In 1933 an International Convention on Parks adopted the first international guidelines for preserving natural areas. The first World Conference on National Parks was held in Seattle in 1962 and the second a decade later.[44] In 1965, a committee of the White House Conference on International Cooperation proposed an international effort to help nations identify and preserve scenic areas and historic sites.[45]

In 1971, the President formally proposed creation of the World Heritage Trust.[46] In response, at its October–November 1972 meeting in Paris, the General Conference of the United Nations Educational, Scientific, and Cultural Organization (UNESCO) adopted an international convention for the preservation and restoration of the outstanding cultural and natural areas of the world.[47]

Areas of special value will be identified on a World Heritage list. This list is to be established by the World Heritage Committee assisted by the UNESCO Secretariat staff, the International Center for the Study of the Preservation and Restoration of Cultural Property, the International Council of Monuments and Sites, and the International Union for the Conservation of Nature and Natural Resources. There will also be a list of endangered areas for which protection is needed

Old Faithful. Yellowstone National Park, an area of unique national and historic value, is listed in the World Heritage Trust.

immediately. When necessary, the World Heritage Committee will provide financial assistance from the World Heritage Fund, to which we and other nations will contribute.

## National Environmental Protection Programs

We have very limited information on the domestic environmental protection programs of other nations. Table 1 highlights domestic pollution control programs in 10 industrial nations—Belgium, Canada, France, West Germany, Italy, Japan, The Netherlands, Sweden, the United Kingdom, and the Union of Soviet Socialist Republics. Most of this information was derived from a draft EPA bibliography on environmental laws in other nations and from the report of the Secretary of Commerce to the President and the Congress,[18] which is required annually under Section 6 of the Federal Water Pollution Control Act Amendments of 1972, on the potential international economic impacts of pollution control programs in the United States and abroad. The information collected by the Commerce Department is derived from previously published sources, the accuracy of which has not been verified by the Department or the Council. Information presented for the USSR stems largely from contacts by the Council and other Federal agencies with Soviet environmental officials under the Agreement on Cooperation in the Field of Environmental Protection Between the United States and the USSR.[49] Although sketchy, this information gives some idea of pollution control programs elsewhere.

A number of the world's industrial nations still lack comprehensive air and water pollution control laws and programs. In some nations, relatively broad legislative authorities have yet to be implemented. In several, the national government has very limited legal authority to deal with pollution problems, and existing pollution control programs are administered by local governments. Information is generally not available on whether implementation of legislation is vigorous.

Several laws go beyond current U.S. authority. Japan authorizes recovery on a no-fault basis for damages to health from pollution. The Netherlands' water pollution control program includes effluent fees that will be gradually increased as an incentive to limit effluent discharges. The United Kingdom enacted a Deposit of Poisonous Wastes Act in 1972 along the lines of legislation proposed by the President of the United States. It appears that none of the nations has air or water pollution control programs as comprehensive or as stringent as those established here by Federal legislation in 1970 and 1972. In particular, legislative deadlines for establishing and meeting standards is almost exclusive to the United States.

Perhaps the most significant conclusion to be drawn from the information available is that most industrialized nations are moving to strengthen their pollution control programs. Nearly all the nations included in Table 1 have enacted major legislation since 1970, and many are considering additional laws and stronger programs.

## International Trade and Environmental Quality

The emerging international concern for environmental quality is manifested in numerous national actions to set air and water quality standards and require abatement by industry and government. These actions are ultimately translated into increased costs of production. Because environmental protection will result in differing costs in each country—even within the same industry—current price relationships between countries are likely to change somewhat. This section looks at the factors which directly affect relative pollution abatement costs and presents some preliminary data on standards and expenditures in several nations which are major trading partners of the United States.

**Table 1**

## Highlights of National Pollution Control Programs in 10 Industrial Nations

| Nation | Comprehensive pollution control ministry | Clean air law | Clean water law | Other laws | Status of problems and programs |
|---|---|---|---|---|---|
| **Belgium** | None. Premier chairs a steering committee that coordinates 5 ministerial working groups. | 1964 and 1971 laws authorize the Government to regulate space heating, and auto emissions but not electric utility and industrial emissions. | The 1971 Law for the Protection of Surface Waters Against Pollution and an earlier 1950 law prohibit pollutant discharges into coastal or internal waters without government authorization. The Crown may prohibit manufacture, sale, and use of products likely to cause pollution. A 1962 law regulates vessels to prevent oil discharges. | A 1964 law authorizes the Government to limit or prohibit food additives. A 1968 order extended the law to cover pesticide residues. | Serious river and canal pollution cause inadequate clean water supply. Only 5 percent of sewage effluent is treated. Serious air quality problems result from autos, domestic heating, and powerplants. Belgium is one of the world's most densely populated nations. |
| **Canada** | Department of the Environment (1970). Until the 1970's, most authority for pollution control was left to provinces and municipalities. | Clean Air Act of 1971 authorizes Federal Government to set ambient air objectives and to set emission standards necessary to protect health. Other emission standards are set by provincial and local governments under Federal guidelines. Auto emissions and fuel composition are federally regulated. | Water Act of 1970 authorizes Federal designation of water bodies needing control and oversight of control program implementation by regional management agencies (which may use regulations and/or effluent fees). Provinces are primarily responsible for implementation. Fisheries Act of 1970 authorizes special protection for waters used for fishing. Shipping Act of 1970 implements the 1954 Oil Pollution Convention. | Noise, solid wastes, radiation are handled, if at all, by provincial and local governments. The 1968-1969 Pest Control Products Act authorizes regulation of the manufacture, sale, distribution, and labeling of pesticides. | Federal Government has become significantly involved in pollution control since 1970. It is still too early to judge implementation of the new air and water laws. |

| | | | | | |
|---|---|---|---|---|---|
| **France** | Ministry for the Environment and Protection of Nature (1971). | Law of 1961 authorizes controls to protect health and prevent public nuisance; subsequent decrees regulate auto emissions and electric utilities and institute general controls in specified urban areas. | Law of 1964 authorizes regulation through river basin agencies. Subsequent decrees prohibit discharge of toxic and radioactive materials and use of nonbiodegradable detergents. Another 1964 law implements the 1954 Oil Pollution Convention. | 1964 Highway Code and subsequent administrative actions control some noise sources. The 1970 Health Services Codes authorize regulation of pesticides and other toxic substances. Laws of 1943 and 1972 prohibit the use of certain pesticides without special permission. | Broad legal authorities have not been fully implemented. Control of air pollution in Paris and construction of sewage treatment plants have progressed substantially since the early 1960's. Water pollution is a problem in several large cities and in two industrial regions. |
| **Federal Republic of Germany (West Germany)** | None | Under the 1971 Clean Air Law, the Federal Government has authority to regulate industrial emissions, but enforcement powers reside with the States and often are not used. Federal Governmment regulates auto emissions and lead content in gasoline. | Nearly all regulatory and enforcement authority resides with the states. Water Resources Management Law of 1957 has only general provisions on use and quality of waters. 1961 Law on the Use of Detergents requires that they be biodegradable. | Federal Waste Disposal Law of 1972 establishes extensive controls over solid wastes, including required regional disposal plans and authority to prohibit use of containers that cannot be safely disposed of. 1968 Plant Protection Law authorizes restrictions or prohibitions on the use of pesticides to protect human health and animals. | Substantial air, water, and noise problems persist. Federal authority is very limited. |
| **Italy** | None | Air Pollution Law 615 (1966) authorizes emission limitations for some industries and for autos, with variations by zones. Responsibility is divided among 5 Federal ministries and various local authorities. | No comprehensive Federal authority. Laws to protect fish have been used occasionally against polluters. There is an oil pollution law implementing the 1954 Oil Pollution Convention. | Public health laws authorize regulation of pesticide residues in food. | Intense efforts to increase industrialization outweigh environmental concerns, and Federal jurisdiction for protective action is limited. Air and water pollution are widespread. Lakes in northern Italy and coastal waters near Rome, Naples, Genoa, Venice, and Trieste are severely polluted. |

Table 1—Continued

## Highlights of National Pollution Control Programs in 10 Industrial Nations—Continued

| Nation | Comprehensive pollution control ministry | Clean air law | Clean water law | Other laws | Status of problems and programs |
|---|---|---|---|---|---|
| **Japan** | Environmental Agency (1971). | Basic Law for Environmental Pollution Control, as amended in 1970 (1967), is designed to protect health and preserve the environment. Subsequent laws impose criminal sanctions (1970) and provide no-fault relief for damage to health (1972) and control odors (1971). Air pollution Control Law (1968) authorizes auto emission standards, controls on lead and HC in gasoline, and minimum national controls on stationary sources. Japan has decided to require in 1975 auto emission standards comparable to the U.S. standards that have been deferred to 1976. Japan is now the first nation to set emission standards for some older vehicles, requiring retrofit controls. | Water Pollution Control Law (1970) authorizes minimum national effluent standards for discharge sources. Other 1970 laws promote regional sewage treatment systems and control discharges from ocean vessels. A 1951 law, amended in 1968, authorizes a ban on any discharge found to harm aquatic life. A 1970 law controls ocean dumping of solid wastes. | Noise Control Law (1968), with 1970 amendments, regulates auto, construction, and other major noise sources. Poisonous and Deleterious Substances Control Law (1970) regulates consumer products containing hazardous materials. Agricultural Land Pollution Control Law (1971) and the Agricultural Chemical Control Law (1971) regulate sale and use of agricultural chemicals. Waste Disposal and Public Cleaning Law (1970) regulates industrial waste disposal through local agencies. | Highly concentrated population and industry make Japan one of the most heavily polluted nations, giving rise in recent years to widespread public complaints and litigation. Widespread health damage is reported from air pollution, and half the commercial fishing in coastal waters has been ruined by pollution. Accounts vary on the effectiveness of the new laws. The government's traditional role as active industrial benefactor makes some observers skeptical about prospects for pollution cleanup. |

| | | | | | |
|---|---|---|---|---|---|
| **The Netherlands** | Ministry of Public Health and Environmental Hygiene is responsible for most pollution control, but policy decisions come from the Physical Planning Council. | Air Pollution Act (1970) establishes regulatory system based on licenses for polluting facilities, administered by central, provincial, and municipal governments (law not yet in effect). | Pollution of Surface Waters Act (1969) prohibits discharges without a permit. A fee is charged for a discharged effluent, based on its quantity and characteristics. The fee is to be increased gradually as an incentive for facilities to achieve better controls. Pollution of Seawater by Oil Act (1958) implements the 1954 international oil pollution convention. Drinking Water Act (1957) sets health standards. | Various laws impose controls on noise. The Public Nuisance Act (1952) permits the prohibition of any installation that would endanger the environment. Pesticides and Allied Substances Act (1962) regulates pesticides and related substances. | Considered by many to be the most pollution-conscious nation in Europe with strong antipollution commitment at all levels of government. Nearly all surface waters are polluted by mercury, nitrogen, phosphates, and other industrial wastes. Topography and climate help to reduce air pollution except in several industrialized areas where it is severe. |
| **Sweden** | National Environmental Protection Board and Franchise Board. | Environmental Protection Act (1969) requires operating licenses for new or modified facilities in 38 industrial categories, with emission limits based on technical and economic feasibility. Royal ordinances restrict $SO_2$ content in fuel oil and pollution from auto engines. | Water Act of 1918, as amended, contains special chapter on environmental protection. Environmental Protection Act (1969) requires licensing for discharges into surface waters or municipal systems. Act of 1971 bans dumping of waste in Swedish or international waters, and Act of 1972 deals with vessel pollution. | Health Service Law (1958) regulates solid waste disposal. Nature Conservancy Act (1964) covers most aspects of conservation. Public Cleansing Act of 1970 gives municipalities absolute responsibility for collection and disposal of wastes. Act on Products Hazardous to Man and the Environment (1972) contains fundamental principles concerning handling of hazardous products. | Despite a recently initiated national control program, air and water pollution remain significant in localized areas. About half of ambient $SO_2$ drifts into Sweden from other nations. Vast pulp and paper industry accounts for about 90 percent of organic wastes in the nation's waters. |

Table 1—Continued

## Highlights of National Pollution Control Programs in 10 Industrial Nations—Continued

| Nation | Comprehensive pollution control ministry | Clean air law | Clean water law | Other laws | Status of problems and programs |
|---|---|---|---|---|---|
| **United Kingdom** | Department of Environment. | The Alkalai and Works Regulation Acts (1863, 1906, 1966) and the Clean Air Acts (1956, 1968) require annual registration of about 3,000 designated industrial processes; firms must demonstrate that they are using the "best practicable means" determined on a firm-by-firm basis to control emissions. Controls also apply to motor vehicles. | Various laws (1876–1968) require discharges to be approved by one of 32 River Boards which may attach conditions based on receiving water conditions. The Merchant Shipping and Prevention of Oil Pollution Acts of 1971 control oil pollution from vessels. | Noise Abatement Act (1960) regulates auto and aircraft noise. Deposit of Poisonous Wastes Act (1972) regulates land disposal of hazardous wastes. The Department of Environment has substantial authorities with respect to housing, transportation, and siting of industrial facilities. Laws of 1949, 1952, and 1967 authorize regulation of pesticides, including protection of farm workers. | Pollution control laws have a long history, but controls are still sought more by persuasion than enforcement and are generally implemented on a firm-by-firm, technical-economic basis. Water pollution is most prevalent in the industrialized south and east, where sewers and treatment plants are overloaded. A major national spending program has been initiated to upgrade public waste treatment facilities. Sulfur oxides are the main air quality problem. |
| **Union of Soviet Socialist Republics** | None. Hydrometeorological Service has overall monitoring and control function for air, soil, and water pollution. Various Ministries (e.g., Agriculture, Health, Reclamation, and Water Management) have standard-setting roles for different as- | No comprehensive air law. There is a Law on Air Pollution in Moscow of Jan. 8, 1963, and some broad legislation under the heading of the Protection of Health (1969). Part of the "control" strategy is the "sanitary clearance" or buffer zone established between industrial facilities and residential areas. | Principles of Water Legislation of the USSR and the Union Republics (1970) call upon the National Government (Ministry of Public Health) to establish "guiding principles" for water use. Individual republics are primarily responsible for implementation. Primary attention is given to new facilities and to protecting drinking water. | The 1969 Public Health Law Principles contain provisions calling on state agencies and organizations to reduce noise. | Environmental problems being given increasing attention. Special session of Supreme Soviet led to the Decree on Strengthening the Protection of Nature and Improving the Utilization of Natural Resources of Dec. 28, 1972, raising the priority of environmental concerns within the Soviet system, calling for annual and long-range environmental |

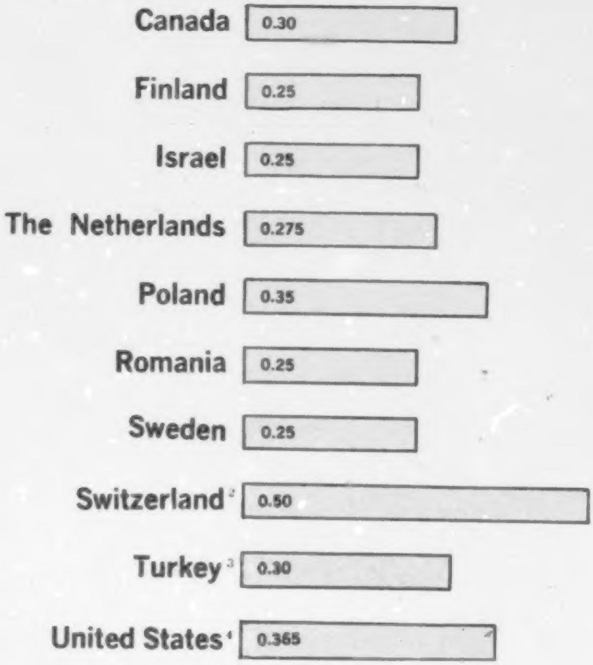
pects of the environment. State Committee for Science and Technology has coordinative role and with Academy of Sciences runs interagency council responsible for overview of environment. Individual republics in many cases have environmental policy bodies.

plans as part of the planning system, and assigning more definite responsibilities for environmental protection among the various agencies of the Soviet Government. Water pollution has received most attention but remains a serious problem. There is also growing concern about air and soil pollution.

Sources: Department of Commerce, *The Effects of Pollution Abatement on International Trade*, under P.L. 92-500 §6 (1972), and CEQ; EPA, "International Environmental Bibliographies: Series 1—Legislative and Regulatory Reports" (April 1973 draft); Pryde, *Conservation in the Soviet Union* (1972), pp. 136–60

Figure 2

**Ambient Air Quality Standards for Sulfur Dioxide in Selected Countries**[1]



[1] Milligrams per cubic meter, 24-hour averaging period. Standards shown are present maximum allowable levels. In each country, the $SO_2$ measured level must not exceed the maximum on at least 95 percent of the days each year. Many other countries have ambient $SO_2$ standards but base them on different averaging periods or allow more flexibility in exceeding the limit.

[2] Standard shown applicable in summer. Winter standard is 0.75 $mg/m^3$.

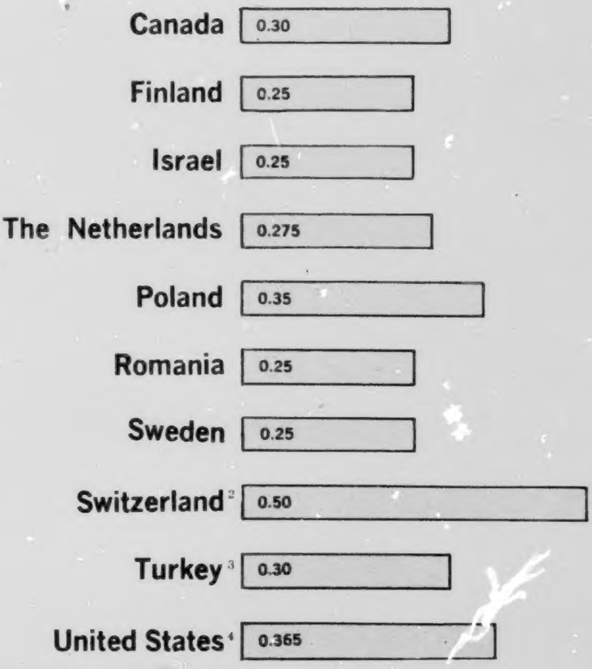
[3] Standard shown is for industrial areas. Residential area standard is 0.15 $mg/m^3$.

[4] The U.S. primary air quality standard shown is designed to protect public health with an adequate margin of safety. The U.S. secondary air quality standards (not shown), designed to protect vegetation and property, are being revised by EPA. These standards represent ambient concentrations of $SO_2$ significantly below the level represented by the primary standard.

Source: University of North Carolina, Department of Environmental Sciences and Engineering, "Collection, Tabulation, Codification and Analysis of the World's Air Quality Management Standards," preliminary data from EPA contract No. 68–02–0556

Figure 2

## Ambient Air Quality Standards for Sulfur Dioxide in Selected Countries [1]



[1] Milligrams per cubic meter, 24-hour averaging period. Standards shown are present maximum allowable levels. In each country, the $SO_2$ measured level must not exceed the maximum on at least 95 percent of the days each year. Many other countries have ambient $SO_2$ standards but base them on different averaging periods or allow more flexibility in exceeding the limit.

[2] Standard shown applicable in summer. Winter standard is 0.75 mg/m3.

[3] Standard shown is for industrial areas. Residential area standard is 0.15 mg/m3.

[4] The U.S. primary air quality standard shown is designed to protect public health with an adequate margin of safety. The U.S. secondary air quality standards (not shown), designed to protect vegetation and property, are being revised by EPA. These standards represent ambient concentrations of $SO_2$ significantly below the level represented by the primary standard.

Source: University of North Carolina, Department of Environmental Sciences and Engineering, "Collection, Tabulation, Codification and Analysis of the World's Air Quality Management Standards," preliminary data from EPA contract No. 68–02–0556

## Comparative Environmental Standards

To the extent that environmental goals are dissimilar in trading nations, the costs of abatement will also vary and readjustment of trade patterns may result. Although there is little doubt that all nations will ultimately have environmental standards, they are likely to differ significantly. The citizens of one nation may perceive the value of environmental quality in a different way than those of another. Developing countries may be willing to sacrifice environmental quality for more income and productive capacity in the short term. Some developed nations may be a few years away from the current level of environmental awareness of the United States, Sweden, or Japan. As the previous section indicated, institutional structures and legislative authority vary widely among nations—in part because of their differing values and degrees of environmental awareness.

Comparing environmental standards across international boundaries is susceptible to many errors and misinterpretations. Methods of measurement often differ, as do the specific circumstances in which the standards apply. Switzerland, for example, has different sulfur oxide standards for winter and for summer; Belgium and France designate special protection zones in which standards are applicable. Perhaps even more important than differences in standards are differences in enforcement—the strictest standard is irrelevant if it is not enforced. We have no means for comparing this factor among countries.

Figure 2 illustrates the range of standards that exists among several nations. The standards shown are for sulfur dioxide concentrations in the air. They are average measurements over a 24-hour period in milligrams per cubic meter. All of the nations listed require that their standards be met at least 95 percent of the time.[50]

## Comparative Costs of Environmental Controls

In addition to differing environmental standards, other factors affect the abatement costs which must be incurred by a nation's industries. Most important is the relationship between natural environmental conditions and the level of air and water discharges. Even with the same ambient standards, two nations could require quite different abatement levels due to differences in meteorological conditions, the total quantity of emissions, the geographic distribution of the emission sources, and other factors which affect the interrelationships between emissions and ambient levels.

Comprehensive international cost data to determine precisely the effects of pollution abatement on prices and economic growth are generally not available. However, the limited data which are available indicate the level of expenditures for pollution control relative to total gross domestic product in several countries. Table 2 summarizes these data based on the estimated expenditures neces-

**Table 2**

### Estimated Incremental Pollution Control Expenditures as a Percentage of Gross Domestic Product 1971–1980 [1]

[In percent]

| | Air | Water | Solid waste | Total |
|---|---|---|---|---|
| United States | 0.7 | 0.5 | .......... | 1.2 |
| Germany [2] | .1 | .6 | 0.1 | .8 |
| Netherlands | .3 | .7 | .1 | 1.1 |
| United Kingdom | .1 | .2 | .......... | .3 |
| Italy | .3 | .6 | .......... | .9 |

[1] Expenditures are defined as capital investment plus operating and maintenance outlays. The definition of incremental or "additional" expenditure may vary among countries.

[2] For the 1971–75 period only.

Source: Based on Organization for Economic Cooperation and Development, *Economic Implications of Pollution Control: A General Assessment*, June 1973

sary to meet legislated requirements. Unfortunately, these data reflect not only different ambient standards, abatement requirements, and costs of capital and labor but also differences in cost definitions and methods of calculation and aggregation. Nonetheless, they do indicate that substantial expenditures are already planned in many industrialized nations and that these expenditures do not appear to differ substantially in relation to the total output of the nations. It can also be seen that planned environmental expenditures, which often seem large in absolute terms, are relatively minor when compared to total output.

Table 3 compares recent investment for pollution control as a percentage of total investment by industry in Japan and the United States. Japan, perhaps even more than the United States, will have to make sizable investments to deal with its environmental problems. In several major industrial categories, Japanese industries are already allocating a greater share of total investment to pollution control than are their U.S. industrial counterparts.

## Subsidies

As the OECD Guiding Principles recognize, trade distortions can also result from differences in cost allocation. To the extent that a country provides government subsidies to firms, the prices of its goods and services will not fully reflect all related costs of protecting the environment. This will cause overconsumption of that country's products and lead to a misallocation of resources compared to that

**Table 3**

## Pollution Control Investment for Japan and the United States

[In percent]

| Year | Industry | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | All industries | | Iron and steel | | Pulp and paper | | Petroleum | | Mining | | Chemicals | | Electric utilities | | Nonferrous metals | |
| | United States[1] | Japan | United States | Japan | United States | Japan | United States | Japan | United States | Japan | United States | Japan | United States | Japan | United States | Japan |
| 1970 | 5.4 | 5.3 | 12.3 | 6.2 | 9.4 | 6.1 | 6.0 | 10.1 | 6.1 | 8.3 | 4.9 | 4.1 | 3.1 | 12.8 | 8.6 | 7.8 |
| 1971 | 7.4 | 9.1 | 12.8 | 10.0 | 20.6 | 14.2 | 9.0 | 14.1 | 2.8 | 15.7 | 8.2 | 7.6 | 4.4 | 17.7 | 10.3 | 12.1 |
| 1972 | 8.2 | 11.5 | 12.3 | 10.4 | 23.3 | 17.8 | 10.7 | 15.5 | 5.1 | 17.7 | 10.9 | 12.6 | 7.9 | 19.8 | 15.3 | 14.6 |

[1] Manufacturing only, does not include electric utilities and mining.

Source: McGraw Hill Publications Co., *Annual McGraw-Hill Survey of Pollution Control Expenditures* 1971–73 (New York: McGraw-Hill Publications Co., 1971–73); Organization for Economic Co-operation and Development, *Survey of Industrial Pollution Control Estimates* (Paris: Organization for Economic Co-operation and Development, 1973).

which would be attained if all domestic and international prices fully reflected the social costs of production and consumption.

A recent survey by the Department of Commerce indicates that a wide variety of subsidies are now in effect.[51] The most common is a reduction in corporate profit taxes through liberalized depreciation allowances. Table 4 compares depreciation policy on pollution control equipment for the United States and seven other nations that engage in substantial international trade.

Reference to the U.S. depreciation subsidy may be misleading because most U.S. corporations have found it more convenient and profitable to use the investment tax credit instead of the relatively modest special depreciation allowance. The investment tax credit applies to all business investment, however, and thus is not a special pollution abatement cost subsidy.

After the depreciation allowance, the next most popular method of subsidization is the low interest or interest-free loan. Japan, for example, lends private industries up to 80 percent of the cost of equipment to control air, water, and noise pollution.[52] France lends up to one-half the cost of such equipment.[53] Canada and Sweden also make direct Government loans for pollution abatement purposes.[54] Borrowing from private sources is supported by Federal guarantees in Germany and by interest rate subsidies in Belgium. There are no comparable programs in the United States, although the Federal Water Pollution Control Act Amendments of 1972 authorizes the Small Business Administration to make special loans to small

**Table 4**

### Depreciation Allowances for Pollution Control Equipment in Selected Countries

| Country | Percentage and time | Comments |
|---|---|---|
| Canada | 100% in 2 years | Equipment purchased 1965–73 |
| France | 50% in 1 year | Facilities built 1968–74, in addition to normal accelerated depreciation |
| Germany | 50% in 5 years | In addition to straight-line depreciation |
| Japan | 50% in 1 year | In addition to accelerated depreciation |
| Sweden | | No accelerated depreciation |
| United Kingdom | | No accelerated depreciation |
| United States | 100% in 5 years | Equipment purchased after 1970 for plants built before 1969; 5-year period must be amortized on straight-line basis; no investment tax credit permitted |

Source: Department of Commerce, *The Effects of Pollution Abatement on International Trade* (Washington: Government Printing Office, 1973), p. 29

businesses to enable them to comply with the Act without suffering substantial economic injury.

The most widely used Government subsidy in the United States is the industrial revenue bond. The prime advantage of industrial revenue bonds is a lower net borrowing cost due to the tax-exempt status of the interest payments. A more complete discussion of industrial revenue bonds is included in Chapter 3, Economics and Environmental Management.

## Impacts of Standards on Trade

The question remains as to what impact environmental standards will have on the balance of trade. The Council on Environmental Quality, the Environmental Protection Agency, and the Department of Commerce have sponsored several efforts to quantify the impacts of pollution control across the entire economy. The initial study, performed by Chase Econometric Associates, was described in last year's Annual Report. Further analysis based on the Chase econometric model, run over a wide range of pollution abatement cost and Government policy alternatives, indicates a maximum negative impact on U.S. net exports of between $2 and $3 billion during the peak years of 1975 and 1976.[55] However, these projections are clearly overestimated because the Chase macroeconomic model made no allowances for foreign pollution abatement regulations.

Another estimate, by d'Arge and Kneese at Resources for the Future, attempts to quantify the net balance of trade effects on the United States assuming similar increases in pollution control costs in other major trading countries. This analysis estimates that U.S. net exports will rise slightly in spite of increased pollution control costs.[56] Another study by The Netherlands stresses the uncertainty regarding the overall effect of pollution control requirements on the balance of payments.[57]

At present, there is not sufficient information to estimate the net trade effects of international pollution abatement with any degree of certainty. To the extent that environmental quality standards and relative investment levels are roughly comparable, as the preliminary data in Figure 2 and Tables 1 and 2 indicate, changes in trade patterns will probably be minor. On the other hand, to the extent that the "polluter pays" principle is eroded by Government subsidy programs, the balance of trade is likely to be distorted. Pressures for Government intervention in the international marketplace will probably increase as many nations begin to clean up their environment. Future developments in the international area need to be carefully watched to avoid trade distortions that in the long run will benefit no one.

## International Cooperation

One of the oldest international environmental activities is exchange and pooling of scientific data information. This section reviews the history of international environmental cooperation,[58] focusing on progress in the past year under the precedent-setting agreement between the United States and the Union of Soviet Socialist Republics and on the new United Nations structure for promoting cooperation.

### Early Scientific Cooperation

Systematic international efforts to extend knowledge of the physical world began in the mid-19th century with periodic international science congresses attended by scientists and representatives of national scientific societies. Among them were the International Health Congress in Brussels in 1853, the International Congress of Chemistry in Karlsruhe in 1860, and the International Congress of Geodesy in Berlin in 1862. In 1901, the International Association of Academies brought together the national academies—which have been important to modern science since the 17th and 18th centuries.

The First World War temporarily interrupted development of an international science structure, but by 1931 the International Council of Scientific Unions (ICSU) was founded. It created interdisciplinary committees on scientific questions, problems, and programs, including the Scientific Committee on Ocean Research and the Scientific Committee on Problems of the Environment. Perhaps the most important of these have been the Comite Special de l'Annee Geophysique Internationale, which planned and coordinated the International Geophysical Year of 1956–57, and the Scientific Committee for the International Biological Programme, established to study large-scale transnational ecosystems.

By the late 1960's, then, an international scientific community was functional—and ready to focus on environmental problems. It had demonstrated, over more than half a century, an ability to coordinate and advance large-scale scientific enterprises. Many of these efforts, from the International Polar Years of 1882–83 to the more recent International Geophysical Year, International Biological Programme, and the International Hydrological Decade, have added significantly to the knowledge needed for international environmental progress in the 1970's.

### Regional Efforts

Regional organizations have been involved in cooperative research and other environmental action programs, especially those related to economic development.

**CCMS**—NATO's Committee on the Challenges of Modern Society was established in 1969 at President Nixon's initiative. The Committee continues with its multilateral "pilot project" approach to speed the exchange of technology and experience on environmental and other problems among industrialized nations.

Last November, six nations—France, Italy, Germany, The Netherlands, the United Kingdom, and the United States—signed a Memorandum of Understanding on the development of low-pollution power systems for automobiles. Japan and Sweden too are interested in this exchange. A second conference to convene in Ann Arbor this fall is expected to initiate a program for developing and testing low-pollution automobile power systems.

CCMS has published documents on air quality modeling, assessment guidelines, and criteria for particulates, sulfur oxides, and carbon monoxide. By the end of 1973, it will publish criteria for nitrogen oxides, hydrocarbons, and photochemical oxidants. The Committee will also publish reports on control technology for these five pollutants this year.

Air quality assessment studies of Ankara, St. Louis, and Oslo are complete. An assessment study of Frankfurt is nearly complete, and studies of Rotterdam, Milan, and Turin are in progress. The air pollution modeling panel continues its active work in advising on the modeling aspects of the assessment studies as well as in making technical appraisals of new research modeling techniques. After the Air Pollution Study is finished, this panel hopes to take on a new role in bringing together air quality managers and model developers.

In the field of water quality, the CCMS Pilot Study on Inland Water Pollution led to the establishment of the U.S.-Canadian Committee on Water Quality Planning in the St. John River Basin between Maine and New Brunswick. Combining Federal, state, and provincial, and local participation, it experiments in transboundary water quality planning. The Committee will report on progress in the fall.

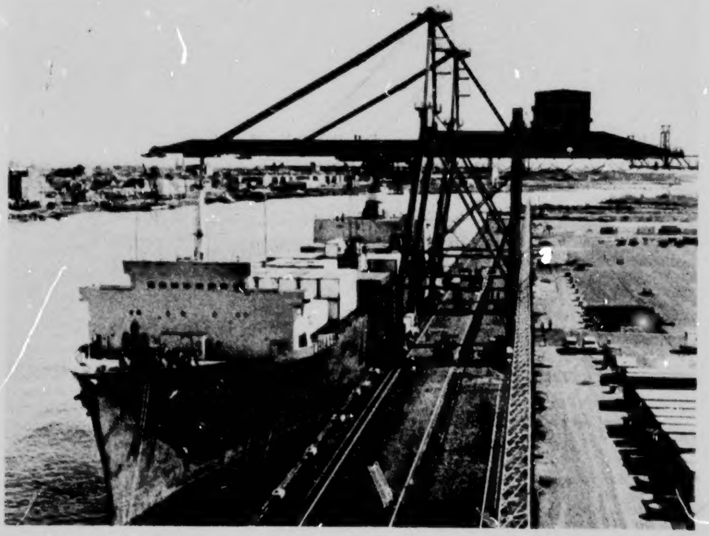
A British-led project will complete construction of an advanced physical-chemical waste water treatment plant in 1974. France and Germany are developing processes using pure oxygen in the project, and Canada will study removal of phosphorus from sewage sludge. The Belgian-led Coastal Water Pollution Pilot Study continues to work with IMCO in implementing the CCMS goal of ending deliberate oil discharges into the ocean by the end of the decade.

**OECD**—The Organization for Economic Cooperation and Development—Japan, Australia, and the industrialized nations of Western Europe and North America—serves as a forum for the exchange of environmental technology and, in particular, for developing an understanding of the economic consequences of environmental controls. Last year's Annual Report discussed OECD's May 1972 Guiding Principles for compatibility of national environmental standards and the "polluter pays" approach to financing. The Guiding Principles recognize the need for harmonized standards and seek to establish a uniform and equitable method for financing private pollution control costs in order to minimize distortions in international trade. The polluter-pays principle means that costs are borne by the polluter and are reflected in the price of his goods and services in lieu of subsidies.

Besides working to implement the Guiding Principles, the OECD Environment Committee continues to promote technical information exchanges. Subgroups have completed studies on advanced methods of reducing pollution—in the pulp and paper industry, from other stationary sources, and by motor vehicles—and on eutrophication and mercury. Work has been initiated on the siting of international airports.

At the initiative of the United States, a special meeting was held in October 1972 on problems relating to polychlorinated biphenyls (PCB's). As a result of this meeting and the substantial work already underway in the Chemical Sector Group, the OECD Council of Ministers has adopted recommendations that member governments minimize release of PCB's into the environment until their use can be stopped.[59]

**Other Regional Groups**—Several other European groups have grappled with environmental issues in various ways. The Council of Europe sponsored the 1970 European Conservation Year. The



To avoid distortion in world trade, costs of environmental protection must be paid by the polluter.

oldest regional body, founded in 1902, the International Council for Exploration of the Sea, coordinates oceanographic activities of its members, most of which are in the North Atlantic area. It promotes research in marine science and development of international conventions to improve fisheries.

The Economic Commission for Europe (ECE) is one of the few international organizations embracing both Communist and non-Communist industrialized nations of the Western World. It thus has a unique potential for promoting environmental cooperation between the Soviet Union and Eastern European countries on one side and the United States and Western European nations on the other. Although political considerations involving the status of East Germany previously hampered progress, these problems are near solution. As a result, the Senior Advisers to ECE Governments were able at their first meeting in April 1973 to adopt a wide-ranging work program dealing with such varied subjects as air pollution, energy, water pollution, toxic wastes, transportation, tourism, and transborder Black Sea pollution. An ad hoc committee will be convened late in 1973 to develop a long-term work program for the consideration of the Senior Advisers at their next meeting.

Some regional organizations established for other purposes have entered the environmental arena. One is the Soviet-bloc Council for Mutual Economic Assistance. Like NATO, it is primarily political in origin, but it has promoted technical and scientific cooperation and research and recently has placed the environment among its higher priorities. Both the Organization for African Unity (OAU) and the Organization of American States have been drawn into environmental issues. The OAU sponsored the 1968 treaty for the protection of African wildlife, and its Committee on National Parks meets and exchanges information on parks.

## Bilateral Cooperation

Significant bilateral cooperation to solve common environmental problems has a relatively short history. Undoubtedly the leading example of extensive bilateral cooperation in sharing information and projects of mutual benefit is the Agreement on Cooperation in the Field of Environmental Protection Between the United States and the Union of Soviet Socialist Republics.[60] Signed in Moscow in May 1972 by Presidents Nixon and Podgorny, implementation is now well along. The 1972 Agreement was presaged at least as early as 1968 when Soviet Academician A. D. Sakharov, in an essay published in *The New York Times,* strongly urged cooperative efforts by our two nations regarding worldwide environmental problems.[61]

In September 1972, a Memorandum of Implementation was signed in Moscow by the Chairman of the Council on Environmental Qual-

Chairman Russell E. Train and Academician E. K. Fedorov talk about environmental problems in Moscow.

ity, Russell E. Train, and Academician E. K. Fedorov of the Soviet Hydrometeorological Service. Subsequently, several working groups have met, both in the United States and in the Soviet Union, to work out specific projects.

The first meeting, held in January in Moscow, dealt with endangered species of plants and animals and with wildlife management in general. Members of the working group were the first U.S. citizens to visit two Soviet scientific reserves, the Oka Terrace Reserve and the Voronez. As a result of the meeting, 22 projects were agreed upon. Seven involve joint research and information exchange on endangered plant species, and six are joint studies of whales and other marine mammals. The nine wildlife projects range from joint research on various species to development of a migratory bird treaty.

A working group on air pollution, meeting in Moscow in March, agreed on development and testing of methods to control sulfur oxides and particulates from fossil fuel powerplants, particularly fuel cleaning and wet stack-gas scrubbing technologies. Projects for mobile sources include common emission sampling and measurement methods, data exchange, and testing of pollution control devices.

The water quality working group, also meeting in Moscow, agreed to study pollution control strategies for river basins. They will use the Moskva and Seversky Donets Rivers in the Soviet Union and the Delaware, Ohio, and other rivers in the United States as models. They also agreed to undertake joint studies of Lake Baikal, the Great Lakes, and Lake Tahoe. Both nations agreed to information exchange on control strategies for various pollution sources. The Soviets expressed particular interest in the oil and pulp and paper industries, automated monitoring equipment and procedures, and mathematical modeling. We expect to gain from their experience in land treatment of sewage sludge and from their toxicology data.

The first Soviets to come to the United States under the Agreement visited Washington, D.C., Atlanta, San Francisco, and New York in April. Various joint programs relating to the urban environment were developed. In May, a group of Soviet legal experts visited the United States. They were briefed on regulatory and enforcement programs. The Soviet experts expressed particular interest in the preparation of environmental impact statements under NEPA.

Other working groups have met in the United States on earthquake prediction, marine oil pollution, pollution and marine organisms, air pollution modeling and instrumentation, and meteorological monitoring and instrumentation.

The United States has exchanged information for many years with Japan, particularly on air and water quality. A joint conference on new sewage treatment technologies was held in the United States in December 1972. In Tokyo, conferences were held on solid waste management and resource recovery in January and on photochemical smog in June. Discussions on mobile sources of pollution are held periodically.

A wide range of additional activities in pollution control are underway with Germany, the United Kingdom, Spain, Poland, Yugoslavia, India, and Tunisia.

## Worldwide Cooperation

**The United Nations**—Several of the specialized agencies of the U.N.'s Economic and Social Council (ECOSOC)—in particular UNESCO, WMO, WHO, and FAO—have long been involved with environmentally related issues, such as international development programs, low-cost housing, urban planning, the peaceful uses of the Antarctic, uses of the high seas, and the seabeds. Many [illegible] mendations of the 1972 U.N. Stockholm Conference make specific mention of these agencies in connection with environmental projects.

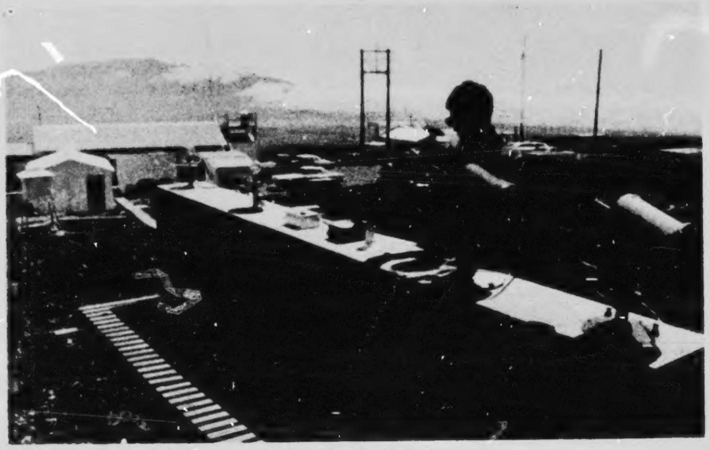
The U.N. Educational, Scientific and Cultural Organization (UNESCO) has developed and is now implementing its Man and the Biosphere (MAB) program—an interdisciplinary program of research which emphasizes an ecological approach to the study of interrelationships between man and the environment. UNESCO also served as the forum for the negotiation last fall of the World Heritage Trust, and it will have a continuing active role in this important area. Building on its World Weather Watch, the World Meteorological Organization (WMO) now receives information on pollutants from a large number of the 100 cooperating regional stations, and it plans a global network to increase this monitoring. WMO works closely with UNEP and will play a key role in the priority monitoring programs. The World Health Organization (WHO) is deeply involved in the development of information on the effects of pollutants on health. The Food and Agriculture Organization (FAO) is concerned with monitoring of food contamination and with pesticides, soils, and many other important environmental problems.

Until last year, the rapidly growing efforts undertaken in the specialized agencies of the U.N. family had only the loosest coordination. There was no mechanism to draw into U.N. environmental efforts those countries which are not active in these agencies. Nor was there a means to draw attention to environmental problems outside the scope of responsibilities of specialized United Nations organizations. As a result of the 1972 U.N. Conference on the Human Environment in Stockholm, a new U.N. Environmental Program (UNEP), under the leadership of Maurice Strong, who was Secretary-General of the 1972 Conference, was created. UNEP reports to the U.N. General Assembly through ECOSOC. UNEP will coordinate the activities of the specialized U.N. agencies, initiate action when it is needed, and create and implement a cohesive Action Plan for global environmental protection.

In order to finance projects developed by UNEP and to augment U.N. environmental programs, the General Assembly approved the voluntary U.N. Environmental Fund that had been proposed by the President in February 1972 and agreed to at Stockholm the following June. The President has proposed that the United States contribute on a 40-60 matching basis to meet the Fund's initial 5-year goal of $100 million. He included $10 million in the 1974 budget to carry out the U.S. pledge. The House of Representatives recently passed the necessary authorizing legislation.[62] Other nations have pledged $6 million for 1973 and a total of $53 million for the 5-year period.

Coordination between UNEP and the specialized U.N. agencies is being carried out through the Environmental Coordination Board composed of the heads of UNEP and the specialized agencies. A report on the initial activities of the Board was discussed at the first meeting of UNEP's 58-member Governing Council, held in Geneva in June. The Council decided upon procedures for use of the new U.N. Environmental Fund and, after considering proposals regarding the 109 recommendations of the Stockholm Conference, instructed the Executive Director to develop programs for an information referral system and global pollution monitoring. The Executive Director is to present detailed proposals at the next Council meeting to be held in Nairobi in March 1974.

**Earthwatch Program**—One major recipient of assistance from the Fund will be the new Earthwatch Program, endorsed in Stockholm and later approved by the General Assembly. Earthwatch is designed to assess global environmental conditions; one of its first projects will be to measure pollution levels around the world and study their effects on climate. A network of 110 monitoring stations will be set up under the auspices of the U.N. World Meteorological Organization. Ten baseline stations will be sited in remote areas for comparison of air quality with that in developed areas. The Earthwatch Program includes plans to monitor the oceans, radioactive wastes, food contamination, and changes in the numbers of plants and animals which might indicate hazardous conditions in the environment.



A scientist at the Earthwatch station at Mauna Loa Observatory, Hawaii.

## Conclusion

In previous Annual Reports, we pointed out that environmental improvement in the United States depends upon responsive institutions and adequate legal authorities. The same requirements hold true in the international arena, although their achievement among nations is more difficult than within nations. But as international attention has focused on environmental concerns, there has been progress in creating institutions and a body of international law and practice necessary for global cooperation in preserving environmental quality.

New institutions have been formed and older ones reformed. The U.N. this year gave special status and funding to its new Environmental Program (UNEP). Through UNEP, the U.N. should provide more vigorous environmental leadership than was previously possible by its several agencies with uncoordinated environmental interests. The United States recently proposed that IMCO be designated as the standard-setting agency for vessel discharges and ocean dumping. This proposal was well received by the IMCO Council and will be taken up at IMCO's October 1973 conference.

Regional institutions as varied as NATO and the Organization of American States are turning attention to common environmental problems. In Europe, where some of the world's worst transboundary pollution problems are found, efforts to achieve controls across national boundaries are still in a preliminary stage. The U.S.-Canadian Great Lakes Water Quality Agreement, as well as the institutional arrangements emerging in the heavily polluted, multistate northeastern United States, may well serve as useful models for action.

The world community is also moving forward to adopt necessary legal authorities to control pollution and preserve the world's natural heritage. Ratification of international agreements requires more time between proposal and enactment than is usually the case domestically. Considerable international "legislation" is now pending before nations for their approval. These include the new ocean dumping convention and several new IMCO conventions and amendments. A comprehensive new IMCO convention is anticipated this fall, and the Law of the Sea Conference will take place next year. Two major conventions to protect the world's natural heritage—the endangered species and world heritage conventions—are also awaiting ratification. Each is the first of its kind internationally.

As with domestic environmental problems, the most important force for international action is broad public interest and commitment to environmental quality. Rarely in history has a new concern moved so rapidly from relative obscurity to a center position in dealings among nations. Momentum for positive international action has been established, and the outlook is promising.

## Footnotes

1. U.S. Department of Commerce Press Release, "Marine Scientists Warn of High-Seas Contaminants" (Feb. 13, 1973).
2. 42 Stat. 821–22 (Pub. Res., No. 65 of July 1, 1922).
3. Charter, D.B., and Porricelli, J.D., "Quantitative Estimates of Petroleum into the Oceans," a paper presented to the Marine Environment Ocean Affairs Board, National Academy of Sciences-National Research Council (May 21–25, 1973).
4. International Convention for the Prevention of Pollution of the Sea by Oil, May 12, 1954 [1961] 3 U.S.T. 2989, T.I.A.S. No. 4900, 327 U.N.T.S. 3; Sweeney, "Oil Pollution of the Oceans," 37 *Ford. L. Rev.* 155, 190 (1968).
5. Sweeney, *supra* note 4 at 192.
6. Prevention of the Pollution of the Sea by Oil Amendments Adopted by the Conference of Contracting Governments to the Convention of 1954, April 11, 1962, 17 U.S.T. 1523; T.I.A.S. No. 6109, 600 U.N.T.S. 332.
7. Sen. Exec. Print E, 91st Cong., 2nd Sess. (May 20, 1970).
8. Id.; H.R. 738, S.1067, 93rd Cong., 1st Sess. (1970).
9. Sen. Exec. Print K, 92nd Cong., 2nd Sess. (May 5, 1972).
10. Id.
11. Sweeney, *supra* note 4 at 193.
12. Water Quality Improvement Act of 1970, P.L. 91–224, 84 Stat. 91, §§ 11–13; Marine Protection, Research and Sanctuaries Act, P.L. 92–532, 86 Stat. 1052; Water Pollution Control Act Amendments of 1972, P.L. 92–500, 86 Stat. 816, §§ 311–312.
13. Statement by Russell E. Train, Chairman of the Council on Environmental Quality, to the Council of the Inter-Governmental Maritime Consultative Organization in London, June 5, 1973.
14. Council on Environmental Quality, *Ocean Dumping—A National Policy* (1970).
15. P.L. 92–532, 86 Stat. 1052.
16. Marine Protection, Research and Sanctuaries Act of 1972, P.L. 92–532, 86 Stat. 1052, Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, London, 3 E.L.R. 40329 (November 1972).
17. Agreement with Canada on Great Lakes Water Quality, T.I.A.S. No. 7312 (April 15, 1972).
18. P.L. 92–500, 86 Stat. 816, §§ 2 (101(c)), 7.
19. 15 U.S.T. 1606; T.I.A.S. No. 5[illegible]9.
20. 13 U.S.T. 2312; T.I.A.S. No. 5200.
21. 17 U.S.T. 138; T.I.A.S. No. 5969.
22. E.g., Arctic Waters Pollution Prevention Act, 18–19 Eliz. 2, c. 47 (Can. 1970) [Canada]; The Declaration of Santiago, 4 Whiteman, Digest of International Law, § 17, pp. 1089–1090 (1965) [Chile, Ecuador, Peru].
23. 11 *International Legal Materials* (1972, unbound), 1416, 1420.
24. Environmental Protection Agency, Municipal Waste Water Systems Division, unpublished data, July 11, 1973.
25. Joint Communique Following Talks Between Richard Nixon, President of the United States of America, and Luis Echeverria, President of the United Mexican States, June 15–16, 1972 (June 17, 1972).
26. Unless otherwise indicated, the following discussion of pre-1972 actions to protect the world's natural heritage is based on Caldwell, *In Defense of Earth*, ch. 3 (1972).
27. L. Talbot, "Endangered Species," editorial, 20(6) *Bioscience* 331 (1970).
28. L. Talbot, "Why Care about the Javan Tiger?" 58 *Christian Science Monitor* 13 (1967).
29. *Plato, Timaeus and Critias* 136 (Taylor, transl., 1929).

30. Emperor Asoka, "Pillar Edicts" (250 B.C.), quoted by Maharajah of Mysore, in *Indian Wild Life Bulletin* (December 1952).
31. International Convention on International Trade in Endangered Species of Wild Fauna and Flora, Washington, March 3, 1973 (transmitted to Senate for its advice and consent, April 13, 1973).
32. British & Foreign State Papers 102:969(F) Martens (2nd) 30:686(G), March 19, 1902.
33. 39 Stat. 1702, U.S.T.S. No. 628; II Redmond 2645 (1916).
34. 172 L.N.T.S. No. 3995, 1935 (1936).
35. 56 Stat. 1354, 161 U.N.T.S. 193, T.S. 981 (Oct. 12, 1940).
36. 16 U.S.C. § 668 aa et seq.
37. See note 31, *supra.*
38. Unless otherwise indicated, information in this section on pre-1972 international whaling measures is based on Caldwell, *supra* note 26, at 63–66.
39. 49 Stat. 3079, 3 Bevans 26 (1931).
40. 35 *Fed. Reg.* 18319 (1970).
41. 16 U.S.C. § 1361 et seq.
42. International Whaling Convention, Dec. 2, 1946, 62 Stat. 1716, 4 Bevans 248, Marine Mammal Protection Act of 1972, P.L. 92–522.
43. 16 U.S.C. § 21, R.S. § 2474 (1872).
44. Caldwell, *supra* note 26, at 185.
45. Id.
46. Message to the Congress on the Environment, 7 *Presidential Documents* 187 (Feb. 8, 1971).
47. Convention Concerning Protection of the World Cultural and Natural Heritage, Paris (Nov. 16, 1972), Sen. Exec. Print F, 93 Cong., 1st Sess. (1972).
48. P.L. 92–500, 86 Stat. 816, § 6.
49. Agreement Between the United States of America and the Union of Soviet Socialist Republics, Cooperation in Environmental Protection, May 23, 1972, T.I.A.S. No. 7345.
50. University of North Carolina, Department of Environmental Sciences and Engineering, "Collection, Tabulation, Codification and Analysis of the World's Air Quality Management Standards," preliminary data from Environmental Protection Agency contract No. 68–02–0556 (1973).
51. U.S. Department of Commerce, "The Effects of Pollution Abatement on International Trade" (1973), a report to the President and the Congress under § 6 of P.L. 92–500 (1972).
52. Ibid.
53. Ibid.
54. Ibid.
55. Chase Econometric Associates, Inc., "The Economic Impact of Pollution Control Upon the General Economy. A Continuation of Previous Work," prepared for the Environmental Protection Agency (October 1972).
56. d'Arge and Kneese, "Environmental Quality and International Trade," 26 *International Organization* 2 (Spring 1972).
57. The Netherlands Central Planning Bureau, "Economic Impact of the Control of Water Pollution by Biodegradable Material" (Aug. 1972).
58. Unless otherwise indicated, information in this section on pre-1969 activities is based on Caldwell, *supra* note 26, at 119–144.
59. Organization for Economic Cooperation and Development, Recommendations c(73) 1(final) (20 Feb. 1973).
60. Council on Environmental Quality, *Environmental Quality—The Third Annual Report of The Council on Environmental Quality* 105–107 (1972); 3 E.L.R. 40327 (1973).
61. See Caldwell, *supra* note 26, at 133–134.
62. H.R. 6768, 93rd Cong., 1st Sess. (1973). House passage, *Cong. Record* 3648, May 15, 1973; Senate passage, *Cong. Record* 10674, June 8, 1973.

CHAPTER 8

# The Citizen's Role in Environmental Improvement

The quest for environmental quality has been distinguished by the commitment of concerned citizens, working together in organizations across the Nation. In 1969–70—the period surrounding the first Earth Day—citizen activities grew in size and scope. Established environmental organizations gained members and took on new activities. Many new organizations were founded. This chapter looks at the citizen's role in environmental improvement, in particular at the different types of environmental organizations—their interests and activities, their resources, and their problems. It focuses on the evolution of environmental organizations after the first Earth Day in April 1970.

The chapter is organized in five parts. The first section provides a brief review of citizen activity prior to the late 1960's. The second section illustrates the broadened concern characteristic of the new environmentalism. The third section describes the different types of environmental organizations. The fourth section reviews their major activities. The final section discusses the resources and problems of citizen organizations.

## The Development of Environmentalism

Interest in the environment is not a new phenomenon in the United States. Throughout our history, citizens have been concerned with natural values. Just as the country has changed, so have the environmental issues and the approaches employed in pursuit of environmental goals. The history of the origins and growth of the environmental movement is too extensive to summarize here, but a brief description of several specific issues may give a sense of its evolution.

## The Philosophical Foundation

America in the 18th and 19th centuries was dominated by the frontier. Settlers perceived the continent both as a savage wilderness, uncaring and frequently inhospitable to man, and as a bountiful provider with inexhaustible resources of every kind. The destiny of man was to tame the wilderness and exploit its resources. Little attention was paid to the consequences of doing so. If all the beaver in one valley were trapped out of existence, there were more to be found farther west. If grasslands were overgrazed by cattle, a new rangeland could be found the next year. In a country with such riches, a need for restraint was not imagined.

Nevertheless, the conservation movement in America established its philosophical foundation during this early period. Thomas Jefferson and Ralph Waldo Emerson were important early figures. In the mid-19th century, several influential individuals appeared. John James Audubon, best known for his paintings of birds, spoke out in opposition to the destruction of wildlife. George Perkins Marsh anticipated many of the concepts of ecology in his epic *Man and Nature,* published in 1864. Beyond lamenting past environmental destruction, he described interrelationships among plants and animals and man's dependence on the balance of nature. He was the first to question the notion that our natural resources are inexhaustible.[1] His work was complemented by that of Henry David Thoreau. More a philosopher than an activist, Thoreau quietly and eloquently recorded in his journal his conviction that preservation is a worthwhile goal and that wilderness is justified by the inspiration that men can draw from it.

These men were out of the mainstream of the commercial and political life of the Nation. They had little impact on its policies. For them, preservation was an ethical and moral issue. But their writings provided the philosophical foundations for the next generation of conservationists.[2]

## Hetch-Hetchy

A controversy which arose in 1901 showed that these philosophical concepts had found root but, by themselves, were insufficient to preserve natural values. The issue concerned development of a water supply for the city of San Francisco, which proposed to create a reservoir in the spectacular Hetch-Hetchy Valley in Yosemite National

Park. The question was whether a manmade impoundment should be allowed within a national park. Other sites were available, but the Hetch-Hetchy site was the least costly.

The controversy drove a wedge between two well-known conservationists of the day, John Muir and Gifford Pinchot. Muir, the founder of the Sierra Club, was a naturalist in the tradition of Marsh and Thoreau. Pinchot—appointed Chief Forester and Director of the Forest Service by President Theodore Roosevelt, a great conservation leader—was the man most responsible for changing the original national policy on natural resource utilization. He advocated management of the national forests so as to achieve sustained yields, rather than the common practice of cutting large tracts of timber all at once for immediate gain.[3]

Pinchot, however, had no sympathy for the preservation of inviolate wilderness, viewing it as a waste of resources. He favored the reservoir as a sensible resource development. Muir, a proponent of wilderness, argued that the reservoir would be inconsistent with the national park concept, that it would consume a magnificent scenic area, and would offer no recreational benefits. Muir's philosophical and ethical arguments proved to be insufficient when pitted against the economics-based arguments of the proponents. In 1913 the Hetch-Hetchy Reservoir was approved by the Congress.[4]

## Developing New Arguments

In the early 1950's, a similar controversy showed that wilderness advocates had learned to develop a broader set of arguments. The case concerned the proposed Echo Park Dam in western Colorado—the reservoir would flood a part of Dinosaur National Monument. A coalition of citizen environmentalists and conservation organizations formed to oppose the project. As before, the conservationists argued for preservation as a philosophical concept. This time, however, they utilized hydrological studies of their own to support their view that Echo Park Dam was not needed. As a result of the arguments and of public support, Echo Park was dropped from the development plans.[5]

## Discovering New Tools

There remained as-yet-undiscovered and unused tools for the conservationist cause. One of these, the use of an extensive mass media public education campaign, was vital to conservation efforts in another national conservation controversy, the proposed dam at Bridge Canyon on the Colorado River below the Grand Canyon National Monument. A reservoir behind Bridge Canyon would back up 18 miles into Grand Canyon National Park. Proponents argued that the reservoir would generate necessary hydroelectric power and irrigation water for the Southwest. Conservation opponents argued as before—that the dam would violate the National Park System and jeopardize major scenic and geological resources.

This time, however, the conservation forces were well organized. In early 1964, the Izaak Walton League convened a conference of over 1,000 conservationists to discuss Bridge Canyon Dam. Out of this conference grew a coalition of national and regional conservation organizations and a general strategy of action. The Sierra Club undertook a public education campaign built around *Time and the River Flowing*, a photographic study of the scenic wonders of the Grand Canyon and the Colorado River. A professional advertising agency was employed for the first time to give a conservation issue national exposure. At a later stage of the controversy, the Sierra Club inserted a full page ad in *The New York Times* urging citizens to write their Congressmen opposing the Bridge Canyon Dam. As a result, the Sierra Club lost its tax deductibility, the only time this has happened to an environmental group.

Meanwhile, the National Parks Association (NPA) (now the National Parks and Conservation Association) was also taking a new approach.[6] It undertook an economic and engineering study of the entire plan, devised its own water plan, and circulated the study to key Government officials. The report argued that the Bridge Canyon Dam was economically unfeasible and was unnecessary for water resource development. Public opinion against Bridge Canyon grew. In early 1965 the dam was dropped.

Thus, over the 60 years between Hetch-Hetchy and the late 1960's, new techniques were developed to approach traditional conservation issues. The ethical and philosophical concerns of John Muir were buttressed with the economic and engineering arguments used in the Grand Canyon controversy. Conservation leaders had changed with the times in order to approach new issues more effectively.

## The New Environmentalism

Over the last 5 years, traditional conservation has broadened into the new environmentalism. This important shift has had a number of consequences: the range of issues of concern to citizens has expanded and new types of citizen organizations have appeared.

Traditional conservation was primarily concerned with the preservation of wilderness and wildlife, which continues to be an important theme. In addition, concern about pollution has increased. Interest in air and water pollution has intensified, but citizens are also concerned about other pollution issues like radiation, noise, and pesticides.

The influence that citizen groups can have on national pollution policy was demonstrated in late 1969 by the Citizen's Crusade for

The Santa Barbara oil spill in January 1969 spurred national environmental awareness.

Clean Water, a coalition of 38 environmental groups, including the AFL-CIO. The League of Women Voters, which had identified water resources as a major focus of study as early as 1956, played a key role in the Crusade. The objective of the coalition was to increase Congressional appropriations for waste treatment construction grants for fiscal year 1970. The Crusade pressed the Congress for appropriation of the full $1 billion authorized, compared to $214 million in the budget. The House voted $600 million and the Senate $1 billion. A compromise of $800 million was reached in a House-Senate conference committee.

Citizens have played important roles in dealing with other issues of the new environmentalism. Land use regulation is an example. New state initiatives in land use control—from the creation of the San Francisco Bay Conservation and Development Commission to the land use control system in Vermont—could not have come into existence without strong citizen initiative and support. Citizens have also addressed themselves to energy issues, particularly nuclear power, as well as to solid waste recycling.

The broadening interests of citizens are also demonstrated by the growing concern about the workplace environment. In January of this year, the Oil, Chemical and Atomic Workers struck Shell Oil Company over an issue of environmental health. The workers were

HOW ABOUT BETTER MASS TRANSIT ??
LETS DO IT IN! THE ROAD

Public rallies were held frequently in the early days of the new environmentalism.

concerned with air pollution inside several refineries and its effect on their health. This was the first strike over what is fundamentally an environmental issue. Several traditional conservation organizations, as well as a group of newer environmental organizations, supported the strike.

The concerns of the environmental movement are broadening to include the urban environment, where 70 percent of our population lives. This is evidenced by the recent formation in Washington, D.C., of the Urban Environment Conference, composed of such disparate organizations as the National Welfare Rights Organization, the Environmental Policy Center, the National Tenants Association, the Sierra Club, the United Auto Workers, and others. The conference studies problems of urban transportation and housing and investigates reports of industries threatening workers with job losses when forced to install pollution abatement equipment.

On the local level, some environmental groups are working to break down racial barriers and achieve improvement of the urban environment. In Pittsburgh, 26 organizations have formed the Homestead-Brushton Clean-Up Coalition. In one day they removed 100 tons of debris from vacant lots. With a grant of $190,000 the Coalition plans to inventory vacant lots and abandoned houses and cars, clean litter from vacant lots, and build playgrounds and parks throughout the community. The Coalition views its work as more than a cleanup. It hopes to rehabilitate the community by bringing citizens together and encouraging business to move back into the area.

Public opinion polls described in Chapter 3, Economics and Environmental Management, indicate that concern for environmental deterioration is strongly held by individuals at all income levels. Nonetheless, membership in environmental organizations continues to come primarily from white members of the middle and upper-middle class. One recent indicator of the socioeconomic status of citizen environmentalists is provided by a 1972 study conducted by the National Center for Voluntary Action (NCVA), which surveyed some

Citizen volunteers are important in campaigns to clean up roadside litter.

1,500 volunteers.[7] The study indicated that 98 percent of the members of environmental-conservation organizations is white. Most are well educated, with 59 percent holding a college or graduate degree. Occupationally, a total of 43 percent is engaged in the professional, scientific-technical, academic, and managerial fields. One-half of the NCVA respondents reported a total family income of over $15,000 per year; another 26 percent earned between $10,000 and $15,000; the remaining 24 percent earned less than $10,000.

## Types of Environmental Organizations

There are many ways that the characteristics of environmental organizations can be presented. We have chosen to begin with community and youth groups at the local level, then to review coordinating and resource organizations at the state and regional levels, and to conclude with the national organizations.

### Community Organizations

Most citizens become involved in environmental issues in their own communities. There was a tremendous growth in both the membership and number of community environmental organizations around the first Earth Day. Some concerned citizens formed new community organizations while others chose to take part in the activities of already established organizations, such as a local affiliate of the National Wildlife Federation or chapter of the Sierra Club.

By far the most questionnaires returned in a recent survey conducted by the Council came from community organizations.[8] Slightly more than half of these organizations said that they were founded during or after 1969.

While the environmental movement at the community level is marked by a myriad of interests, many organizations are concerned with a single issue. Members coalesce around a single problem or need—to save a local park from commercial development, perhaps, or to provide educational materials and speakers for local meetings or to act as an advisory committee to the city government.

After the Santa Barbara oil spill, for example, local citizens formed Get Oil Out, Inc., dedicated to stopping oil pollution in Santa Barbara Channel. GOO distributes information about oil pollution to other environmental groups.

In Lebanon, Ohio, the 2,000 members of Little Miami, Inc., are dedicated to the protection of the Little Miami River. The group was instrumental in drafting Ohio's Scenic Rivers Act and in securing protection under the Act of 105 miles of the river.

The environmental movement at the local level is fluid. Organizations often disband when an issue is resolved. In ongoing organizations, the number of members, amount of financial resources, and degree of community support tend to fluctuate in response to the presence or absence of community issues.

Most community environmental organizations have no office or full-time staff. Entirely voluntary, they rely heavily on the energy of a few key people. Sometimes the existence of a group is threatened by the departure of a leader who moves away or becomes interested in other activities. A successful environmental group must continually recruit new members. Many groups surveyed reported that individuals tend to become interested and active only when they are directly touched by an environmental problem—such as when their neighborhoods are threatened by an unwanted development.

Many citizen organizations are learning not only to react to unwanted projects but to go a step beyond—to help in planning better alternatives. Rather than oppose one zoning change after another, for example, some community groups are working for regional land use planning. In some cases, a citizen organization has become an advisory committee to a local government or planning agency.

Whatever the particular interest or activity, community organizations allow a person to participate in environmental decision-making in his own area, and they provide essential grassroots support for the envirmental movement.

## Youth Groups

The recent surge in environmentalism owes much of its impetus to the activities of young people. The Environmental Teach-In was conceived as a student activity, and it was toward campuses that the initial Earth Day efforts were directed. The staff of the Washington office set up to support Earth Day activities was recruited from the campus.

Students responded to the environmental issue with enthusiasm. On some campuses, responsibilities for planning events were shouldered by existing groups. On others, new organizations were formed. Most Earth Day activities were designed to expand public awareness of environmental problems. Student groups sponsored workshops, held rallys, and marched in protest against environmental degradation. In retrospect, it was the energy, enthusiasm, and even showmanship of students that gave Earth Day its unique flavor.

Now, 3 years later, there are far fewer environmental organizations on the college campus. Many groups, set up to plan and carry out activities for Earth Day, disbanded soon after. Some attempted to continue their activities but could not survive. The college campus is a difficult place to sustain an organization. The academic year is broken by examinations and vacations; summer vacations sometimes dampen enthusiasm for the cause popular during spring semester. There is a constant turnover in the student body, so groups always need to recruit new members. In many cases, the continuity of campus organizations depends on key leaders, and when they graduate, no one takes their place. The result has been instability—groups forming and dissolving, with new interests and activities as new leaders emerge.

Recently many college groups have turned their attention toward the local community, working with other conservation and environmental organizations in an area. The students still bring energy and enthusiasm to environmental issues, but it is now channeled toward more tangible activities. Where once they paraded, protested, and picketed, students now research land use patterns, compile environmental voting records, lobby in state legislatures, and seek new ways to become involved in decisionmaking within established institutions and procedures.

One example of this new direction of student environmentalism is the Minnesota Public Interest Research Group (MPIRG) supported by 90,000 Minnesota college students on 19 campuses. MPIRG established a coalition of 14 environmental groups in the spring of 1972. The membership spent the summer studying statewide environmental issues, then drafted and submitted 11 environmental bills to the State legislature.

Student environmental organizations, like community groups, tend to be small and poorly financed. Of 93 college organizations responding to the Council's questionnaire, 47 percent indicated that they have

Young people are especially concerned about environmental problems. These students are learning how to detect water pollution.

fewer than 25 members, and 59 percent reported an annual budget of less than $500. Membership dues are the primary source of funds for 24 percent of college groups, while 52 percent rely on special fundraising projects. About 10 percent is supported primarily by allocations from the student government treasury.

High school students too have shown a strong environmental concern, and the history of high school groups is similar to that of college organizations. Many high school groups were organized for the first Earth Day. Lacking the resources of a university community, most were not able to go beyond their Earth Day efforts to more lasting projects. Groups with strong leaders and interested members, however, were able to carry on. They encounter many of the same obstacles that have hampered college groups—fragmentation of the school year by exams, loss of leadership, and lack of resources.

Activities at high schools are almost entirely volunteer. Only three groups reported a budget of more than $1,000, and 60 percent indicated that they spend less than $500 annually. One student leader probably spoke for the majority of high school groups when he said, "We have no true treasury as our financial resources are usually spent before they can be recorded into a book." Income derives primarily from the operation of small recyling centers or from the sale of educational materials.

Despite their meager resources, some high school groups are quite active. In Winston-Salem, N.C., for example, Youth for a Cleaner Environment recently began to monitor pollution in one of the city's urban creeks. Students walked the length of the creek, carefully noting the location and nature of each discharge. The group sent a report to the city government which forwarded it to the State for action. They visited owners of businesses that were polluting the creek, showed them their findings, and asked their help in stopping the pollution. The students also conducted a guided tour for newspaper reporters and public officials. The effort of this high school group has kept local citizens aware of pollution in their community and, in several instances, has led industries to stop their discharges. Youth for a Cleaner Environment has also carried out other projects—including a recycling center and an ecology fair—and has given numerous speeches about environmental problems in Winston-Salem.

One incentive for high school students to work for environmental quality is the President's Environmental Merit Awards Program. The Program recognizes student projects which lead to environmental understanding or improvement. Projects may involve education, preservation, restoration, or planning. Evaluation is by a local committee, which may determine that the individual, group, or school should receive either the President's Environmental Award or the President's Special Award for Environmental Excellence. The former is given for having taken part in an environmental project; the latter recognizes special achievement. Since the inception of the Program in October 1971, about 12,000 awards have been presented.

Students in Flint construct a nature trail near their school.

### State Coordinating Councils

In a growing number of areas, community and student environmental groups have joined to form a coordinating council. The objective is straightforward: by speaking with a single voice, the several groups can increase their effectiveness. Although the primary interests of the various member groups may differ, they lend their names and support to positions taken by the governing board of the council.

Coordinating councils sometimes maintain close ties with national environmental organizations and serve as a liaison between local and national groups. Several support one or more representatives in their state capitals to present the views of environmental groups; many publish a regular newsletter to keep their members up to date on environmental issues. Such councils are supported by membership dues paid by organizational and individual members.

The Oregon Environmental Council (OEC) typifies the activities of state coordinating councils. It represents 85 organizations, including groups as diverse as Portland Planned Parenthood, Willamette River Greenway Association, and Oregon Citizens for Clean Air. The OEC also has 2,000 individual members.

OEC's small full-time staff is involved in a broad range of environmental activities. It has sponsored or helped develop many bills in the Oregon Legislature, including legislation related to coastal planning, open space taxation, and the establishment of bicycle trails. It has also testified at numerous public hearings on nuclear power, timber management, wilderness protection, and urban development proposals; filed suits against the Oregon State Highway Division and HUD alleging failure to comply with the National Environmental Policy Act; and published the 64-page *To Live with the Earth,* which outlines ways that individuals can minimize their adverse environmental impact.

Problems are sometimes encountered in achieving concensus among groups located in different parts of a state or interested in different issues. Conflicts arise from the natural desire of member organizations to retain their autonomy. A coordinating council may need several days to coordinate a position with all constituent groups. The Conservation Council of Virgina (CCVa) is one coordinating council that has dealt successfully with such problems.

CCVa was organized in 1968 after a hearing before the Virginia General Assembly convinced several environmentalists that if conservation groups could cooperate and organize, their united voice would make them more effective. They convened a group of 70 environmental leaders later that year and reached agreement to establish a coordinating structure. A steering committee drafted bylaws which reflect the groups' desire to work together without sacrificing their autonomy. The Council may speak for any of its constituent groups only upon written request from that group. Upon formal request of a member group, the Council will specify which of its organizations, if any, dissent from the Council's stated position or course of action.

CCVa members generally feel that these procedures have worked well. In practice, some Council actions simply infer the support of the member organizations, especially if the action regards an issue on which a member organization has taken no formal position. When a consensus does not appear to exist on an issue, the Council often takes no position.

## Regional Service Centers

There are 11 regional service centers located throughout the country: from Environment/Alaska in Anchorage to the Environmental Information Center in Winter Park, Fla., and from the New England National Resources Center in Boston to California Tomorrow in San Francisco. Most were organized in recent years with the aid of the Conservation Foundation. They are tax-exempt, nonprofit educational organizations. Foundation grants and private donations constitute most of their annual budgets, which range from $7,500 to $200,000. Most maintain a full-time staff of four or five professionals and publish a regular newsletter. Their programs vary somewhat, but their general purpose is to strengthen the effectiveness of local environmental organizations by carrying out projects and assuming functions which are beyond the means of the local groups.

One of the first and largest of the regional service centers is the Rocky Mountain Center on Environment (ROMCOE). Established in 1968 in Denver, it now serves the eight Rocky Mountain States of Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming. ROMCOE's professional staff of 10 provides environmental services to government, commerce, and the general public, in addition to environmental organizations. These services include forums on environmental topics, ecological research, environmental planning assistance, and information and clearinghouse functions.

ROMCOE's record of activities and accomplishments is long and diverse. Among other actions, it has conducted conferences to bring business and environmental interests together to discuss such topics as power development in the Southwest, has provided office services and conference space to numerous citizen groups, has helped organize citizen environmental groups in several states, and has analyzed possible impacts of ski area development in the Vail area.

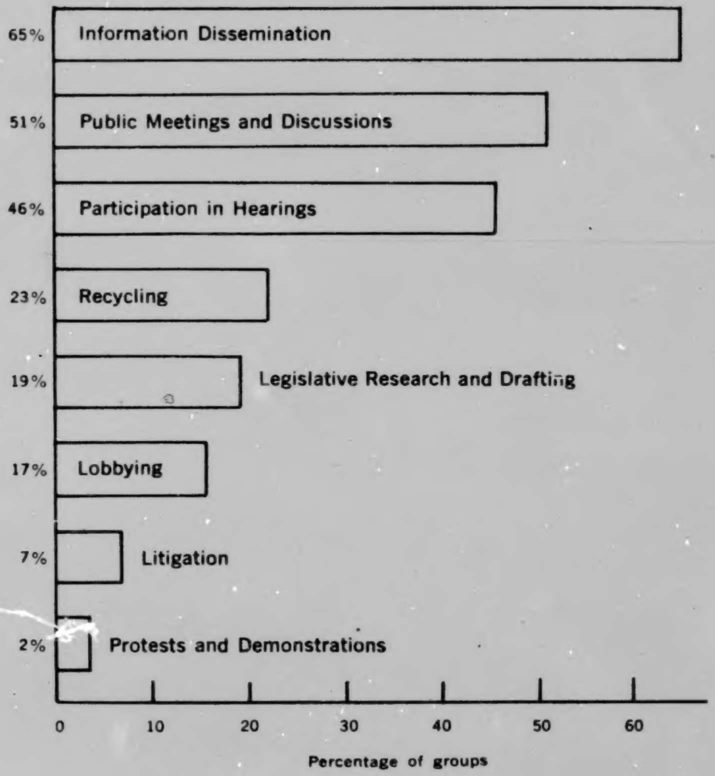
## National Organizations

National environmental organizations are more familiar to the general public. They too have diverse characteristics. Some, like Environmental Action, Inc., Friends of the Earth, the Sierra Club, and the National Audubon Society have wide environmental interests, others not. The Wilderness Society, for example, concentrates primarily on the preservation of wilderness, and the Sport Fishing Institute is dedicated to the protection and propagation of gamefish. Both organizations, however, sometimes take positions on other issues.

Some national organizations have members across the Nation. Of these, the National Wildlife Federation is the largest, with 3.5 million members. Other large membership organizations—the Sierra Club, Wilderness Society, Friends of the Earth, National Audubon

Figure 1

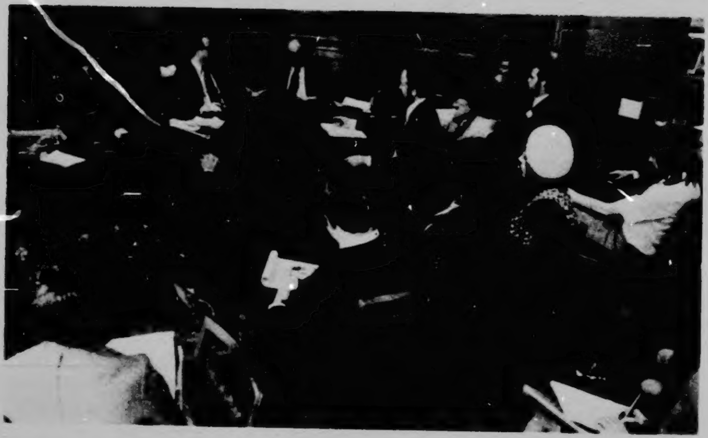
## Major Activities of Environmental Groups



Source: Clem L. Zinger, Richard Dalsemer, and Helen Magargle, 1972, *Environmental Volunteers in America*, prepared by The National Center for Voluntary Action for the Environmental Protection Agency under Project No. R801243

Society, and Sport Fishing Institute—represent 530,000 citizens. The League of Women Voters, with 152,000 members, devotes a substantial amount of its effort to environmental issues. Still other national organizations such as the Environmental Policy Center do not seek members.

More than other environmental groups, the national organizations monitor the development of national environmental policy, gather data and develop information on national environmental problems, and identify issues. The leaders of the national environmental organizations communicate with members and groups at the state and



Workshops are used to train citizen environmental leaders.

local levels. Thus, the national organizations play a leadership role for citizen environmentalists throughout the Nation.

## Activities

Activities of environmental groups today reflect the breadth of interests of the new environmentalism (see Figure 1). Groups are involved in activities as diverse as taking handicapped children on camping trips, building vest pocket parks, monitoring noise pollution, and lobbying against billboards.

- In New York City, Volunteers in Parks organizes cadres of volunteers to maintain city parks, including cleanup and landscaping projects.
- In Natick, Mass., the Lake Cochituate Watershed Association, Inc., has trained and equipped over 50 volunteers to monitor water quality. When pollution is discovered, the group makes a complaint and follows through to see that the problem is remedied.
- In Chicago, Businessmen for the Public Interest has filed a number of lawsuits and published long reports on more than 20 industrial polluters of Lake Michigan.
- In Massachusetts, the Nantucket Conservation Foundation, Inc., purchases and preserves unique tracts of land. It recently created a system of bicycle paths to make its holdings more accessible.

Summarizing the range of environmental activities is not simple. The problem is complicated further because some environmental groups concentrate on one activity, whereas others pursue many interests. Nevertheless, the activities of environmental groups can be generally described under five headings: information dissemination, political action, recycling, legal action, and land acquisition.

## Information Dissemination

Many environmental organizations see information dissemination as a major tool for effecting a better environment. Seventeen percent of the groups responding to the Council's survey indicated that education and information projects were their primary interest.

At the national level, Environmental Action, the Wilderness Society, the Sierra Club, and Friends of the Earth, among others, publish periodicals to keep their readers informed about major environmental issues. The latter three report on proposed legislation and urge writing letters to Congressmen about specific bills. The National Wildlife Federation (NWF) publishes three periodicals with a total circulation of more than 1 million. In addition, NWF supplies a large amount of educational materials to libraries and schools.

The Sierra Club and Friends of the Earth direct a large part of their efforts toward conservation and environmental education. Both organizations publish photographic essays on spectacular natural areas, often including the writings of such famous wilderness advocates as Muir, Thoreau, and Aldo Leopold. These publications have received worldwide acclaim.

Publications of national groups also report on environmental issues. The Sierra Club has produced a number of paperbacks exploring energy use, oil spills, strip mining, and the like. Groups organized by Ralph Nader have published books describing the nature and extent of air and water pollution and critiquing abatement efforts by Government and industry.

The educational efforts of some national organizations are directed at a more specific audience. The Natural Resources Defense Council (NRDC), through its Project on Clean Water, distributes interpretive material and notices of pending Federal and state actions in order to help citizens participate in the campaign for cleaning up the Nation's waterways. The Conservation Foundation, in addition to its many other activities, frequently sponsors citizen training workshops. Its regional workshops on the Clean Air Act of 1970 were instrumental in the founding of numerous clean air coalitions in various cities.

The regional service centers also regularly provide educational materials to other environmental organizations. An illustration is the Central Atlantic Environment Center which was established in 1971 to provide accurate environmental information to citizens in Maryland, Virginia, Delaware, and the District of Columbia. The Center's main activity is to keep interested citizens informed of regional developments that impact on the environment. The Center has published articles on such topics as public management of wetlands and the effects of land use planning on the future of Chesapeake Bay. In addition, it supports the educational activities of statewide citizen conservation councils in Virginia and Maryland. It produces a monthly package of information materials for the Conservation Council of Virginia that enables representatives of more than 40 organizations to maintain communication and keep up to date. The Center also organizes field trips in Maryland so that the citizens can learn about environmental issues and see critical areas firsthand.

Student groups originally placed great emphasis on educational projects. Today, however, few list information dissemination activities as their primary function. This decrease of interest in educational projects may reflect the increasing incorporation of environmental studies programs into the curriculum, which to some extent obviates the need for the student efforts.

Among community organizations, education is still a popular activity. Many local groups maintain a speakers' bureau to lecture on environmental topics at community schools and clubs. CONCERN, Inc., an organization in Washington, D.C., with multiple activities, has prepared and distributed a large number of publications on various environmental issues such as drinking water and solid waste. Groups formed to address a single local issue often disseminate information about their particular concern. For example, the Rutherford County Conservation Council in North Carolina recently prepared an extensive analysis of a proposed reservoir, including its costs and impact on the community. Council leaders believe that the analysis had a significant impact on the opinion of citizens in the community.

## Political Action

Lobbying and other forms of political action are another mode of action used by some environmental groups. The first registered environmental lobbyist in Washington, D.C., began his work in 1954 during the Echo Park Dam controversy. Now there are more than 30 registered environmental lobbyists in the halls of the Congress. Lobbying at the national level is undertaken by the Sierra Club, Friends of the Earth, and Environmental Action, among others. The Environmental Policy Center was organized in 1972 specifically to press for strong environmental legislation. Its full-time staff of 11 is involved in a variety of issues—among them strip mining, water resources projects, national land use policy, and national energy policy.

The League of Conservation Voters illustrates another form of political action. It compiles charts and ranks legislators according to their votes on a number of carefully selected environmental bills. LCV also raises funds and helps organize local campaign efforts. In the 1972 elections, the League distributed over $60,000 in campaign donations and publicly endorsed 57 candidates, of which 43 were elected. In several states, organizations modeled on the LCV have initiated activities.

At the state level, some coordinating councils maintain one or more lobbyists in the capital to represent their interests before the legislature and to keep citizens informed. The Oregon Environmental Council, for example, publishes a weekly calendar of legislative events. The calendar is telephoned to the main office by the Legislative Director every Friday and is in the hands of OEC's members by Monday morning.

Citizens are also politically active at the local level. In western North Carolina, the Upper French Broad Defense Association (UFBDA) has opposed the construction of 14 reservoirs in the upper French Broad Basin for several years. During the 1972 elections, UFBDA worked actively for Board of County Commissioners candidates who were unsympathetic to the reservoir plans. Members of the organization served as campaign chairmen and workers for these candidates. UFBDA sponsored public meetings to provide a forum for the candidates and mailed information about the candidates to its members. All its candidates won seats on the Board. Official support for the project diminished, and shortly thereafter the Tennessee Valley Authority withdrew the proposal.

In the Northeastern States, conservation commissions have developed as important avenues of citizen participation at the community level. These States have enacted legislation enabling a local government to appoint citizens to a conservation commission which then serves as an advisory body to the elected governing board. Since the first in Massachusetts in 1957, local conservation commissions have become established in Connecticut, Rhode Island, New Hampshire, Maine, and, most recently, New York and New Jersey. The number of commissions has increased rapidly in recent years. In 1969, approximately 570 were operating. By 1973, the number had grown to more than 1,300 with a total of 9,000 members. The concept is drawing attention in other parts of the country.

The activities of conservation commissions vary, depending on a state's enabling legislation and the interests of the community that they serve. Some commissions evaluate and comment on environmental impact statements for Federal and state projects in their area. Others acquire and protect open space land. Recently the Commonwealth of Massachusetts gave conservation commissions a major role under its Wetlands Protection Act. Local commissions are responsible for regulating development in coastal lands and waters by issuing permits and restrictive orders.

Perhaps most important, but impossible to assess, is what environmentally concerned citizens do, as individuals, in determining the directions of national environmental policy through the electoral process. No statistics are available on the number of letters that individuals write to their Congressmen, but environmental issues have been important in many recent campaigns.

## Recycling

Many citizens have participated in operating recycling centers. A large number were established at the time of Earth Day. Most recycling centers were manned by volunteers and operated 1 or 2 days each week. People were asked to bring cans, bottles, and newspapers to the recycling center and to separate and place them in containers. After volunteers crushed the glass, flattened the cans, and baled the

Most recycling centers depend upon the cooperation of individual citizens.

newspapers, someone had to truck the materials to an industrial receiving point. After a few months, many recycling centers of this kind ceased to function. It was difficult to recruit volunteers to work Saturday after Saturday or to convince people to bring their recyclable materials to the center. Further, unless a receiving point were located nearby, small volunteer recyling centers were economically marginal.

Nonetheless, recycling continues to be a major activity for 10 percent of the organizations polled by the Council. Students in particular are very active in recyling efforts. Fifty-seven percent of the high school groups and 35 percent of the college groups indicated that recycling is their major activity.

Recycling groups are generally small. Forty-two percent has fewer than 25 members, while the remainder have memberships ranging up to 500. As may be expected, the primary source of income for many (54 percent) of these organizations is the sale of recycled materials (see Figure 2.) Another 37 percent relies primarily on membership dues.

Some environmental groups have succeeded in making recycling profitable. The Citizens Environmental Council in Kansas City, Mo., recycled 1.2 million pounds of newspapers in 1972 and realized a gross profit of $13,000. Its success is due largely to the nearby location of a packaging company which buys the newspapers. The profits from this activity have assured its long-term success.

## Legal Action

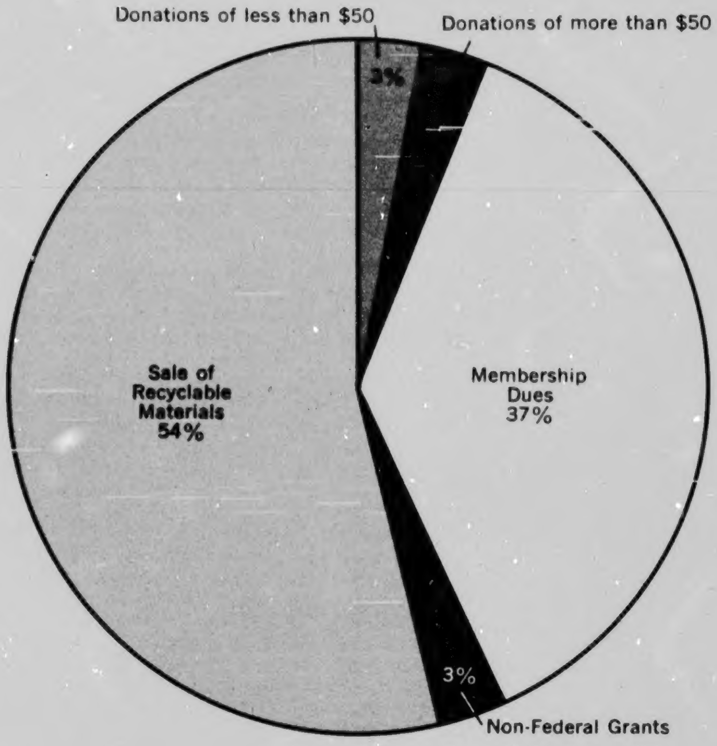
Several environmental groups have been organized especially to bring legal expertise to solution of environmental problems. At the state and local levels, a number of public interest law firms undertake environmental litigation. At the national level, two of the best known are the Environmental Defense Fund (EDF) and the Natural Resources Defense Council (NRDC).

EDF was founded in 1967. Though it has a membership, its work force consists of a team of lawyers and scientists. The legal staff prepares cases for litigation, and the scientists testify as expert witnesses in court. EDF has taken part in a number of environmental cases such as suits to block the Cross-Florida Barge Canal [9] and successful litigation leading to the 1972 ban of most uses of DDT.[10]

NRDC is predominantly lawyers. It has been involved in a wide range of environmental litigation, including suits to delay offshore oil leases in the Gulf of Mexico until an adequate environmental impact statement was prepared,[11] to require the Soil Conservation Service to file environmental impact statements on its channelization projects,[12] and to halt the use of the carcinogenic growth stimulant, DES, in beef cattle feed.[13] This last case resulted in a ban on DES by the Food and Drug Administration.[14] NRDC has also monitored

Figure 2

## Primary Source of Operating Funds of Recycling Groups



EPA's implementation of the Clean Air Act and the Federal Water Pollution Control Act Amendments of 1972.

The Sierra Club has been active in litigation through private attorneys and its own Legal Defense Fund. One suit resulted in the recent Supreme Court decision requiring state implementation plans to prevent deterioration in air quality.[15] The Club is also pursuing litigation to restrain commercial development of the Mineral King area of California's Sequoia National Forest.[16]

Environmental legislation of recent years has increased the opportunities for citizens to participate in the environmental decision-making of government through hearings and by appeal to the courts. Of particular importance is the National Environmental Policy Act. Section 102(2)(C) of that Act requires that every Federal agency prepare a written environmental impact statement on every major Federal action that has a significant impact on the environment. Under CEQ guidelines, this statement is first issued in draft form, giving the public and other Federal, state, and local agencies an opportunity to comment on and evaluate the agency's analysis. Comments, including those of citizens, are reviewed and incorporated into the final draft of the impact statement. Citizens have successfully sought judicial review when an impact statement was not forthcoming or when one did not comply with requirements of the Act. Coupled with the Freedom of Information Act, NEPA has thus afforded the citizen the right to know about, participate in, and ultimately challenge a wide variety of informal agency actions. NEPA is discussed more fully in Chapter 5, Perspectives on the Environment.

Provisions explicitly allowing citizen enforcement have been included in recent Federal pollution control legislation. First incorporated in the 1970 Clean Air Act, the citizen suit provision has subsequently become a part of Federal legislation regarding water pollution, noise pollution, and ocean dumping. These provisions allow citizens to initiate civil suits against persons alleged to be in violation of the law and against the Administrator of EPA for failure to perform a nondiscretionary act. A number of citizen suits brought under the Clean Air Act are currently pending in the courts.

Litigation is sometimes avoided through compromise. An example is the recent controversy surrounding construction of a $150 million liquid natural gas (LNG) import facility in Maryland on Chesapeake Bay. The Columbia LNG Corporation planned to construct terminal and storage facilities on a 1,100-acre tract adjacent to Calvert Cliffs State Park. Vessels would have unloaded at a mile-long pier on the Bay. A coalition of conservation organizations—led by the Sierra Club and the Maryland Conservation Council and including the League of Women Voters, National Aububon Society, and Izaak Walton League—filed suit in the U.S. District Court. They appealed the Federal Power Commission's approval of the facility on the grounds that the tract had been designated by the State of Maryland as a proposed addition to the State park.[17]

The parties were able to reach a compromise and settle out of court. Columbia LNG Corporation agreed to use only 323 acres of its 1,100-acre site for construction of facilities and to dedicate 600 acres to open space, of which 125 acres will be open to the public. In addition, the Corporation agreed to replace the proposed pier with a 6,000-foot underwater pipeline and to lease a mile-long beach and a 190-acre fresh water marsh to the State for $1 per year.

Law students are also active in environmental law. At several universities they provide legal assistance to other environmental groups and, in some cases, participate in legal proceedings. At the University of Michigan, the 40 members of the Environmental Law Society have assisted in drafting several new laws. In addition, the Society has filed friend-of-the-court briefs in a number of environmental suits, helped attorneys with legal research, and appeared at several administrative hearings. A Harvard Law School group has participated in legal activities, including a citizen suit under the Clean Air Act to require EPA to promulgate aircraft emissions standards.[18]

### Land Purchase

Some environmental organizations emphasize preservation of land in its natural state. Prominent nationally is the Nature Conservancy. The Nature Conservancy acquires land by purchase or gift and either retains ownership or transfers title to another group who will be responsible for its conservation. In addition, the Nature Conservancy sometimes aids other organizations and agencies in negotiating a land purchase. Since 1953, it has been involved in nearly 1,000 preservation projects totaling some 380,000 acres of land. Lands held by the Nature Conservancy are available for educational purposes. Often nature trails and interpretive materials are developed.

Acquiring land for wildlife habitat is an important activity of some environmental organizations.

## The Environmental Movement—Resources and Problems

### Membership

According to the Council's survey, there are now about twice as many environmental organizations as before Earth Day. One-half the groups from which the Council heard did not exist before 1969.

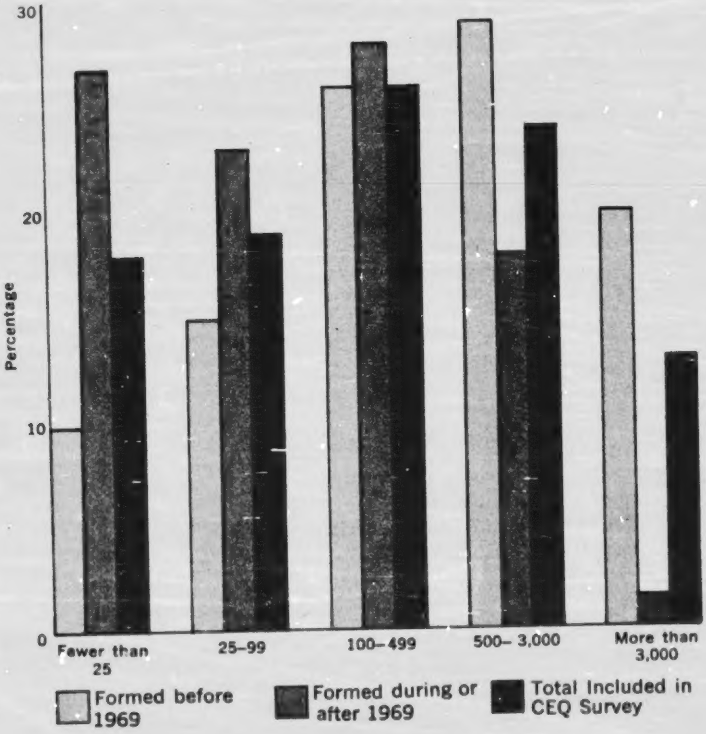
The newer groups appear to be as firmly established as the older ones. Most of the weaker organizations have disappeared, and the number of organizations is beginning to stabilize.

The number of individual environmentalists, however, appears to be still growing. Over 50 percent of the groups responding to the Council's survey reported an increase in membership since Earth Day, and another 24 percent reported a stable membership. Only 13 percent of the groups has fewer members.

Most environmental organizations are rather small: 63 percent reported a 1972 membership of less than 500, and 18 percent had fewer than 25 members (see Figure 3). Groups formed before Earth Day tend to be larger. Forty-nine percent of the older groups reported current memberships of more than 500 citizens. Only 22 percent of the newer groups reported memberships that large. Conversely, 50 percent of the newer groups has fewer than 100 members; the corresponding figure for older groups is 25 percent. The smaller

**Figure 3**

**Size of Environmental Groups**



size of the groups founded around Earth Day may reflect the fact that many (40 percent) were formed to address a specific environmental issue and thus attracted fewer members than if they had worked on many different projects. Of course, these groups have been established for a comparatively short period and have had less opportunity to build a large membership.

As in most volunteer organizations, the majority of the work is done by a few extremely active members. Their number is in many ways a better indicator of a group's manpower resources than total membership. The study by the National Center for Voluntary Action (NCVA) attempted to distinguish between active and total membership. It indicated that the number of active members has increased in 59 percent of environmental organizations and has remained stable in another 36 percent. In only 5 percent of the groups has the number of active members decreased.

The rapid growth of environmental groups creates the problem of organizing and coordinating volunteer members. Most environmental leaders are extremely busy, speaking frequently to civic groups, traveling to conferences and meetings, and planning and directing projects and activities. Thus pressed for time, they are often unable or unwilling to take time to train others to share the workload. The NCVA survey showed, not surprisingly, that most environmentalists are more interested in pursuing environmental issues than in performing the housekeeping chores of organizing membership drives, cataloging and filing material, and supervising project committees. Leaders of the more viable organizations have learned to fulfill organizational and management roles in order to hold their organizations together.

## Income

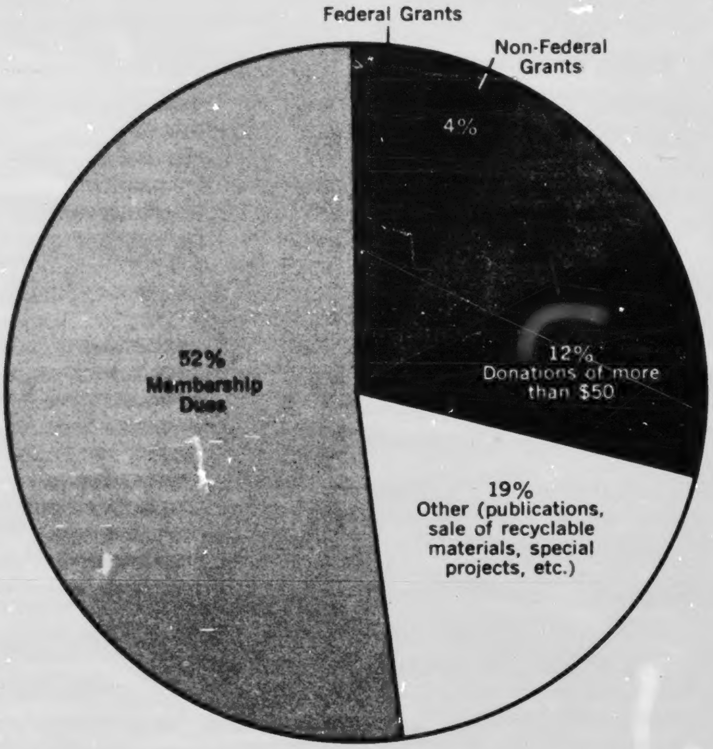
Membership size is also important because many organizations, especially community groups, rely on membership dues and donations for their operating funds. Such groups sometimes have a weak financial base (see Figure 4). One large and very active group experiences an annual membership turnover rate of 37 percent. So far, new memberships have balanced losses so that financial support has been steady. If new memberships should decrease substantially, the organization would be in serious financial trouble.

Overall, 61 percent of the groups reported dues and small donations as their primary source of income. Because memberships are growing, annual budgets of most environmental groups are also growing. Budget increases were reported by 65 percent of the groups; only 15 percent reported a decline. Budget trends are similar for old and new groups.

Although most budgets are increasing, they are still quite small (see Figure 5), and many groups reported that inadequate funds

**Figure 4**

## Primary Source of Operating Funds of Environmental Groups

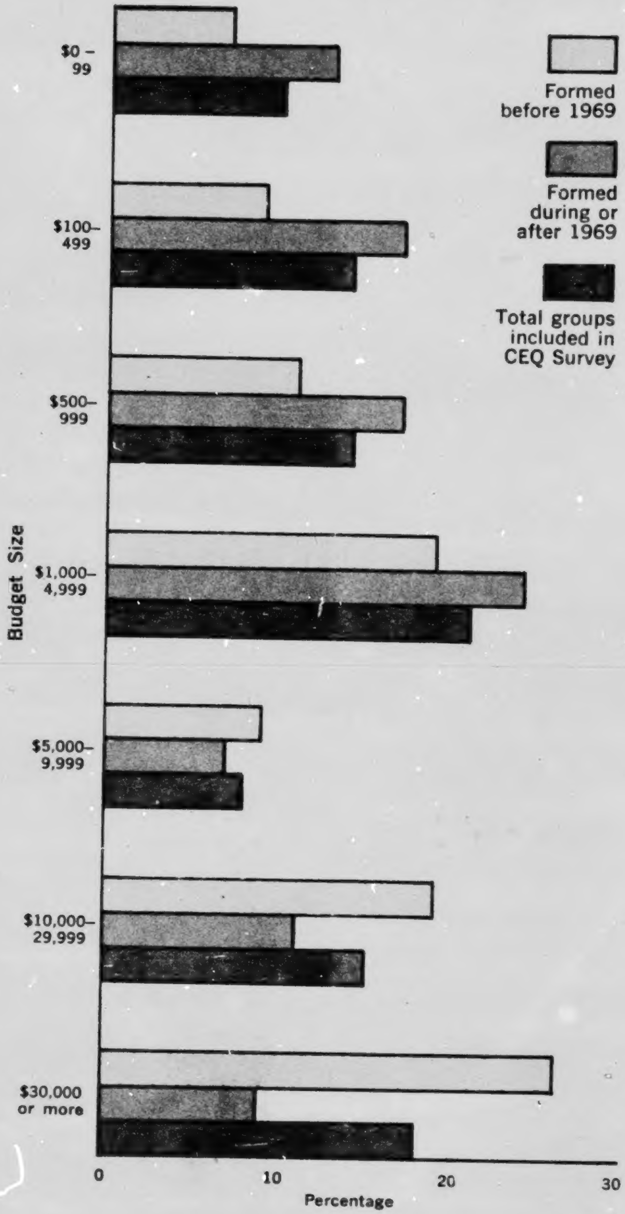


prevented them from accomplishing as much as they would like. The Council's survey showed that 69 percent of the respondents, predominantly community organizations, have annual budgets of less than $5,000, from which postage, telephone, research, duplication of materials, and travel to meetings and public hearings must be paid. Litigation is limited for most environmental groups unless an attorney will work for little or no fee. Often day-to-day expenses are paid out of the pockets of a group's more active members.

Some organizations obtain tax-deductible status in an attempt to attract donations. Donations are the primary financial support for 21 percent of the organizations responding to the Council's questionnaire.

**Figure 5**

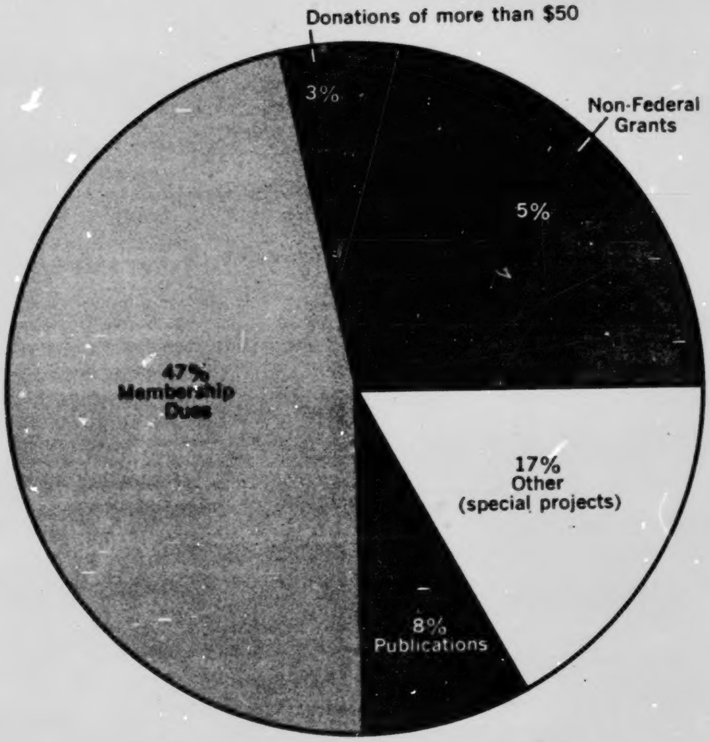
**Annual Budgets of Environmental Groups**



Grants from the Federal Government and private foundations are another source of funds. Federal grants are the main form of support for only 4 percent of environmental organizations. For the most part, these groups are engaged in educational activities such as preparing curriculum materials or sponsoring demonstration recycling projects. In fact, environmental groups with a primary interest in information dissemination, which is a costly activity, are able to draw larger financial backing than are other groups. Twenty-seven percent of the groups has a budget of more than $30,000, a reflection of the availability of Federal and foundation grants for environmental education (see Figure 6). Of all environmental groups, including the comparatively large national organizations, only 14 percent has a budget of that size.

**Figure 6**

**Primary Source of Operating Funds of Educational Groups**



Foundation grants support about 4 percent of the environmental groups. Most of these are national organizations, such as the Natural Resources Defense Council, or regional service centers, such as the Rocky Mountain Center on Environment. The long lead time necessary to plan and apply for foundation grants does not make this method of funding workable for most environmental groups. Some environmental education organizations can plan their activities in this way, but action-oriented groups cannot. Further, many major foundations have been unwilling to support organizations engaged in controversial issues.

Lack of funds has made it impossible for most community groups to rent office space or hire staff. Many organizations do not have a real office. The base of operations may change frequently as individuals tire of handling organization business from their homes. Such groups often lack the sense of permanence and community identity that an identifiable headquarters brings. The NCVA study found that groups with a full-time staff are likely to be active on a wider variety of issues, to use a wider variety of techniques, and cooperate more often with other groups.

## Commitment

Statistics on numbers of members and size of budget do not give an accurate picture of the importance of environmental groups. More significant is the ability and dedication of active citizens. The old expression "Where there's a will, there's a way" is relevant here. Environmentalists share values and are willing to work hard to further them. It is this commitment, above all else, that provides the strength of the environmental movement.

## Summary

Citizens play an important role in identifying dangers to the Nation's environment and in prompting action to prevent them. Early controversies concerning the protection of wilderness brought the development of new techniques. More recently environmentalists have acquired economic and scientific expertise and have used political and legal action to further their concerns.

From its genesis in conservation issues, the environmental movement has recently undergone remarkable growth and diversification. To the traditional concerns of wilderness and wildlife preservation have been added the issues of the new environmentalism—pollution, the urban environment, land use, energy policy, and the like. Although environmentalism has developed slowly throughout our history, the period of 1969–70—culminating around Earth Day—brought a rapid rise in public awareness and involvement in environ-

Volunteers remove debris from a West Virginia stream.

mental issues. During that period there was an increase in the size of existing organizations and a proliferation of thousands of new ones. While some groups grew, others faltered. It now appears that the movement has stabilized with about twice as many active organizations today as before Earth Day. The great majority are either remaining stable or growing stronger.

The growth in environmental concern has been accompanied by an emphasis on new types of activities. Some groups stress legal or political activities, while others disseminate educational materials or run recycling centers. Still others, from the national to the local level, engage in several of these activities. Groups of all types face similar problems of organization and funding.

Whatever their interests and activities, and despite their problems, environmental organizations are an important vehicle for citizens who wish to work actively for a better environment. Their efforts have influenced the development of environmental policy in recent years and, in light of the continued growth of most groups, will continue to do so in the future.

## Footnotes

1. Stewart L. Udall, *The Quiet Crisis* (New York: Holt, Rinehart and Winston, 1963), p. 72.
2. Interview by Ronald Outen with Dale Jones, Northwest Representative, Friends of the Earth, in Portland, Oreg., Feb. 27, 1973.
3. Harold T. Pinkett, *Gifford Pinchot: Private and Public Forester* (Urbana: University of Illinois Press, 1970), pp. 6–14.
4. David W. Ehrenfeld, *Biological Conservation* (New York: Holt, Rinehart and Winston, Inc., 1970), p. 8.
5. Jeffrey D. Stansbury, "The Last Wilderness" (unpublished manuscript, 1964), p. 35.
6. *Id.* p. 46.
7. Clem L. Zinger, Richard Dalsemer, and Helen Magargle, *Environmental Volunteers in America*, prepared by the National Center for Voluntary Action for the Environmental Protection Agency under grant No. R801243 (Environmental Protection Agency, Office of Research and Monitoring, 1972) (mimeograph). Information from this report is drawn upon in detail in subsequent sections of the chapter, where it is cited as the NCVA report.
8. National survey of 5,000 environmental organizations conducted by CEQ in the winter of 1972. Data are based on 1,300 questionnaires returned. Unless otherwise cited, data appearing in this chapter are from this survey.
9. Environmental Defense Fund v. Corps of Engineers, 2 ERC 1173 (D.D.C. 1971).
10. Environmental Defense Fund v. Ruckelshaus, 2 ERC 1114 (D.C. Cir. 1971).
11. Natural Resources Defense Council v. Morton, 3 ERC 1558 (D.C. Cir. 1972); Natural Resources Defense Council v. Morton, 3 ERC 1623 (D.C. Cir. 1972).
12. Natural Resources Defense Council v. Grant, 5 ERC 1001 (E.D.N.C. 1973).
13. Natural Resources Defense Council v. Richardson, Civil No. 2174–71 (D.D.C., filed Nov. 28, 1971).
14. 37 *Fed. Reg.* 15747 (1972).
15. Sierra Club v. Ruckelshaus, 4 ERC 1815 (D.C. Cir. 1972).
16. Sierra Club v. Morton, 405 U.S. 727, 3 ERC 2039 (1972).
17. El Paso Algeria Corp. v. F.P.C. *appeal docketed*, No. 72–3122, 5th Cir., Oct. 5, 1972.
18. Quinn v. Ruckelshaus, Civil No. 72–3529G (D. Mass., filed Nov. 17, 1972).

APPENDIX A

# Organization and Staff of the Council on Environmental Quality

## The Council

Russell E. Train, Chairman, was formerly Under Secretary of the Interior. From 1965 to 1969 he was President of the Conservation Foundation and has been active in a number of other conservation organizations, both national and international. Previously Chairman Train headed the Treasury Department's tax legislative staff before being appointed to the Tax Court of the United States, on which he served for eight years. Following the 1968 election, President-elect Nixon appointed him chairman of a special task force on environmental problems. He was named Chairman of the Council in 1970.

John A. Busterud and Dr. Beatrice E. Willard are the other Members of the Council, both appointed in 1972. Mr. Busterud was Deputy Assistant Secretary of Defense for Environmental Quality from 1971 to 1972. Prior to this, he practiced law with a San Francisco firm specializing in conservation and antitrust law. He was a member of the Assembly in the California Legislature. His activities have involved him in many conservation projects.

Dr. Willard, an ecologist, is former President of the Thorne Ecological Institute of Boulder, an ecology center for industrial and government decision-makers. She served as chairman of the Denver Olympic Planning Board and as secretary of the Colorado Air Pollution Control Commission. She has been a professor of biology at the University of Colorado, has taught in the public schools, and was a ranger naturalist in the National Parks. She has authored books on alpine ecosystems.

## The Council Staff

The Council's staff is primarily responsible for developing policy proposals through legislation, special reports, task forces, and other means. It also assists in the coordination of Federal environmental policy. The staff is responsible for review and evaluation of Federal activities which have a potential effect on the environment and for policy development relating to such activities. Roger Strelow is Staff Director. Steven D. Jellinek is Assistant Staff Director, and J. Clarence Davies III, William J. Dircks, Stephen Gage, William Matuszeski, Steffen W. Plehn, Barrett J. Riordan, and Stephen Sloan are senior staff members. Staff members are Edwin H. Clark II, Diane L. Donley, Brian P. Jenny, Robert D. Lunt, Warren R. Muir, Sheila A. Mulvihill, Bruce A. Pasternack, Stephen Rattien, Grace H. Reppert, Phillip E. Schambra, and Marvin I. Singer.

## General Counsel

The General Counsel's office is responsible for review of legislative and regulatory matters coming before the Council, specifically with regard to interpretation and implementation of the National Environmental Policy Act. Timothy Atkeson, General Counsel to the Council, is assisted by David Cook, Neil Orloff, and Philip E. Soper.

## Secretary to the Council

The Secretary's office is responsible for policy development and coordination with the program development staff. It also oversees primary staff support activities, including budget, personnel, and administration. Boyd H. Gibbons III, Secretary to the Council, is assisted by John R. Fogarty, Public Information Officer; Willis G. Savage, Administrative Officer; and Lois A. Brooks, administrative assistant.

## Advisors

Shirley T. Black serves as special assistant to the chairman.

Technical advisors on the Council staff provide expertise in the areas of science and international affairs. They are Lee M. Talbot, Senior Scientist, on leave from the Smithsonian Institution, who is assisted by Gerard Bertrand, and William A. Hayne, International Officer, who is assisted by Henry H. Janin. Francis S.M. Hodsoll, on loan from the Department of State, is special assistant for the Committee on the Challenges of Modern Society. Jack Perry is also on loan from the Department of State as a special assistant for Soviet Affairs.

## Supportive Staff

Marian L. O'Connell, Ruth W. Nefflen, and Marjory D. Bianchi are executive assistants to the chairman, Mr. Busterud, and Dr. Willard, respectively. Other staff members are: Julia Alessio, Margaret C. Battle, Vicki L. Boyd, Bernice J. Carney, Olga S. Chemerys, Joyce M. Cox, Joseph W. Creekmore III, Odelia L. Doggette, Elizabeth A. Ference, Michael R. Flowers, Margaret M. Gugino, Nancy D. Heflin, Marianne Hollister, Joanne V. Kennedy, Margaret Kennedy, Anna M. Klocke, Barbara A. Luckett, Betty Marshall, Michael D. McCommas, Muriel L. Montgomery, N. Jayne Parker, Janet Peck, Barbara E. Sergeant, Katherine R. Soaper, Thomas Walker, and Norma L. Williams.

## Interns

With the Council for a part of 1973 have been: Phillip J. Arnold, California Institute of Technology; Edward J. Beckwith, Georgetown University; Theron D. Blakeslee and Richard A. Block, The Principia College; Robin Breeskin, a Montgomery County public school teacher; Mary K. Butler, a management intern at the Environmental Protection Agency; Robert H.

Cole, University of Pennsylvania; Drew S. Diehl, Duke University; Robert S. Dohner, Harvard University; Michael S. Dow, The Principia College; Donald L. Dworsky, University of Wisconsin; Bruce Engelbert, University of California, Berkeley; Benjamin Hobbs, Principia College; Donald P. Kanak, University of North Carolina; Trudy Klees and Tracy Lay, Prescott College; Robert Luth, University of California, Riverside; Alan J. Malina, Cornell University; Peter Miecznikowski, Colgate University; Judith A. Miller, Yale University; Ronald B. Outen, University of North Carolina; Henderson Pritchard, Denison University; Michael L. Rodemeyer, Harvard University; Joanne Sawicki, Wellesley College; David Scheffer, Harvard College; Moreland L. Smith, The Principia College; Herbert F. Stevens, The Catholic University of America; Joanne S. Takahashi, Stanford University; Kathie Whipple, Wellesley College; and James G. Williard, The Principia College.

APPENDIX B

# The National Environmental Policy Act of 1969, Public Law 91-190 January 1, 1970 (42 U.S.C. 4321-4347)

An Act to establish a national policy for the environment, to provide for the establishment of a Council on Environmental Quality, and for other purposes.

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,* That this Act may be cited as the "National Environmental Policy Act of 1969."

### Purpose

Sec. 2. The purposes of this Act are: To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality.

## Title i

### Declaration of National Environmental Policy

Sec. 101. (a) The Congress, recognizing the profound impact of man's activity on the interrelations of all components of the natural environment, particularly the profound influences of population growth, high-density urbanization, industrial expansion, resource exploitation, and new and expanding technological advances and recognizing further the critical importance of restoring and maintaining environmental quality to the overall welfare and development of man, declares that it is the continuing policy of the Federal Government, in cooperation with State and local governments, and other concerned public and private organizations, to use all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans.

(b) In order to carry out the policy set forth in this Act, it is the continuing responsibility of the Federal Government to use all practicable means, consistent with other essential considerations of national policy, to improve and coordinate Federal plans, functions, programs, and resources to the end that the Nation may—

(1) Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;

(2) Assure for all Americans safe, healthful, productive, and esthetically and culturally pleasuring suroundings;

(3) Attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences;

(4) Preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity, and variety of individual choice;

(5) Achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities; and

(6) Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

(c) The Congress recognizes that each person should enjoy a healthful environment and that each person has a responsibility to contribute to the preservation and enhancement of the environment.

Sec. 102. The Congress authorizes and directs that, to the fullest extent possible: (1) the policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this Act, and (2) all agencies of the Federal Government shall—

(A) Utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decisionmaking which may have an impact on man's environment;

(B) Identify and develop methods and procedures, in consultation with the Council on Environmental Quality established by title II of this Act, which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations;

(C) Include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on—

(i) The environmental impact of the proposed action,

(ii) Any adverse environmental effects which cannot be avoided should the proposal be implemented,

(iii) Alternatives to the proposed action,

(iv) The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and

(v) Any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

Prior to making any detailed statement, the responsible Federal official shall consult with and obtain the comments of any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved. Copies of such statement and the comments and views of the appropriate Federal, State, and local agencies, which are authorized to develop and enforce environmental standards, shall be made available to the President, the Council on Environmental Quality and to the public as provided by section 552 of title 5, United States Code, and shall accompany the proposal through the existing agency review processes;

(D) Study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources;

(E) Recognize the worldwide and long-range character of environmental problems and, where consistent with the foreign policy of the United States, lend appropriate support to initiatives, resolutions, and programs designed to maximize international cooperation in anticipating and preventing a decline in the quality of mankind's world environment;

(F) Make available to States, counties, municipalities, institutions, and individuals, advice and information useful in restoring, maintaining, and enhancing the quality of the environment;

(G) Initiate and utilize ecological information in the planning and development of resource-oriented projects; and

(H) Assist the Council on Environmental Quality established by title II of this Act.

SEC. 103. All agencies of the Federal Government shall review their present statutory authority, administrative regulations, and current policies and procedures for the purpose of determining whether there are any deficiencies or inconsistencies therein which prohibit full compliance with the purposes and provisions of this Act and shall propose to the President not later than July 1, 1971, such measurers as may be necessary to bring thier authority and policies into conformity with the intent, purposes, and procedures set forth in this Act.

SEC. 104. Nothing in section 102 or 103 shall in any way affect the specific statutory obligations of any Federal agency (1) to comply with criteria or standards of environmental quality, (2) to coordinate or consult with any other Federal or State agency, or (3) to act, or refrain from acting contingent upon the recommendations or certification of any other Federal or State agency.

SEC. 105. The policies and goals set forth in this Act are supplementary to those set forth in existing authorizations of Federal agencies.

## Title ii

### Council on Environmental Quality

SEC. 201. The President shall transmit to the Congress annually beginning July 1, 1970, an Environmental Quality Report (hereinafter referred to as the "report") which shall set forth (1) the status and condition of the major natural, manmade, or altered environmental classes of the Nation, including, but not limited to, the air, the aquatic, including marine, estuarine, and fresh water, and the terrestrial environment, including, but not limited to, the forest, dryland, wetland, range, urban, suburban and rural environment; (2) current and foreseeable trends in the quality, management and utilization of such environments and the effects of those trends on the social, economic, and other requirements of the Nation; (3) the adequacy of available natural resources for fulfilling human and economic requirements of the Nation in the light of expected population pressures; (4) a review of the programs and activities (including regulatory activities) of the Federal Government, the State and local governments, and nongovernmental entities or individuals with particular reference to their effect on the environment and on the conservation, development and utilization of natural resources; and (5) a program for remedying the deficiencies of existing programs and activities, together with recommendations for legislation.

Sec. 202. There is created in the Executive Office of the President a Council on Environmental Quality (hereinafter referred to as the "Council"). The Council shall be composed of three members who shall be appointed by the President to serve at his pleasure, by and with the advice and consent of the Senate. The President shall designate one of the members of the Council to serve as Chairman. Each member shall be a person who, as a result of his training, experience, and attainments, is exceptionally well qualified to analyze and interpret environmental trends and information of all kinds; to appraise programs and activities of the Federal Government in the light of the policy set forth in title I of this Act; to be conscious of and responsive to the scientific, economic, social, esthetic, and cultural needs and interests of the Nation; and to formulate and recommend national policies to promote the improvement of the quality of the environment.

Sec. 203. The Council may employ such officers and employees as may be necessary to carry out its functions under this Act. In addition, the Council may employ and fix the compensation of such experts and consultants as may be necessary for the carrying out of its functions under this Act, in accordance with section 3109 of title 5, United States Code (but without regard to the last sentence thereof).

Sec. 204. It shall be the duty and function of the Council—

(1) To assist and advise the President in the preparation of the Environmental Quality Report required by section 201;

(2) To gather timely and authoritative information concerning the conditions and trends in the quality of the environment both current and prospective, to analyze and interpret such information for the purpose of determining whether such conditions and trends are interfering, or are likely to interfere, with the achievement of the policy set forth in title I of this Act, and to compile and submit to the President studies relating to such conditions and trends;

(3) To review and appraise the various programs and activities of the Federal Government in the light of the policy set forth in title I of this Act for the purpose of determining the extent to which such programs and activities are contributing to the achievement of such policy, and to make recommendations to the President with respect thereto;

(4) To develop and recommend to the President national policies to foster and promote the improvement of environmental quality to meet the conservation, social, economic, health, and other requirements and goals of the Nation;

(5) To conduct investigations, studies, surveys, research, and analyses relating to ecological systems and environmental quality;

(6) To document and define changes in the natural environment, including the plant and animal systems, and to accumulate necessary data and other information for a continuing analysis of these changes or trends and an interpretation of their underlying causes;

(7) To report at least once each year to the President on the state and condition of the environment; and

(8) To make and furnish such studies, reports thereon, and recommendations with respect to matters of policy and legislation as the President may request.

Sec. 205. In exercising its powers, functions, and duties under this Act, the Council shall—

(1) Consult with the Citizens' Advisory Committee on Environmental Quality established by Executive Order No. 11472, dated May 29, 1969, and with such representatives of science, industry, agriculture, labor, conservation organizations, State and local governments and other groups, as it deems advisable; and

(2) Utilize, to the fullest extent possible, the services, facilities and information (including statistical information) of public and private agencies and organizations, and individuals, in order that duplication of effort and expense may be avoided, thus assuring that the Council's activities will not unnecessarily overlap or conflict with similar activities authorized by law and performed by established agencies.

Sec. 206. Members of the Council shall serve full time and the Chairman of the Council shall be compensated at the rate provided for Level II of the Executive Schedule Pay Rates (5 U.S.C. 5313). The other members of the Council shall be compensated at the rate provided for Level IV of the Executive Schedule Pay Rates (5 U.S.C. 5315).

Sec. 207. There are authorized to be appropriated to carry out the provisions of this Act not to exceed $300,000 for fiscal year 1970, $700,000 for fiscal year 1971, and $1 million for each fiscal year thereafter.

Approved January 1, 1970.

APPENDIX C

# The Environmental Quality Improvement Act of 1970, Public Law 91-224, April 3, 1970 (42 U.S.C. 4371-4374)

## Title ii—Environmental Quality (of the Water Quality Improvement Act of 1970)

### Short Title

Sec. 201. This title may be cited as the "Environmental Quality Improvement Act of 1970."

### Findings, Declarations, and Purposes

Sec. 202. (a) The Congress finds—

(1) That man has caused changes in the environment;

(2) That many of these changes may affect the relationship between man and his environment; and

(3) That population increases and urban concentration contribute directly to pollution and the degradation of our environment.

(b)(1) The Congress declares that there is a national policy for the environment which provides for the enhancement of environmental quality. This policy is evidenced by statutes heretofore enacted relating to the prevention, abatement, and control of environmental pollution, water and land resources, transportation, and economic and regional development.

(2) The primary responsibility for implementing this policy rests with State and local governments.

(3) The Federal Government encourages and supports implementation of this policy through appropriate regional organizations established under existing law.

(c) The purposes of this title are—

(1) To assure that each Federal department and agency conducting or supporting public works activities which affect the environment shall implement the policies established under existing law; and

(2) To authorize an Office of Environmental Quality, which, notwithstanding any other provision of law, shall provide the professional and administrative staff for the Council on Environmental Quality established by Public Law 91–190.

### Office of Environmental Quality

Sec. 203. (a) There is established in the Executive Office of the President an office to be known as the Office of Environmental Quality (hereafter in this title referred to as the "Office"). The Chairman of the Council on Environmental Quality established by Public Law 91–190 shall be the Director of the Office. There shall be in the Office a Deputy Director who shall be appointed by the President, by and with the advice and consent of the Senate.

(b) The compensation of the Deputy Director shall be fixed by the President at a rate not in excess of the annual rate of compensation payable to the Deputy Director of the Bureau of the Budget.

(c) The Director is authorized to employ such officers and employees (including experts and consultants) as may be necessary to enable the Office to carry out its functions under this title and Public Law 91–190, except that he may employ no more than 10 specialists and other experts without regard to the provisions of title 5, United States Code, governing appointments in the competitive service, and pay such specialists and experts without regard to the provisions of chapter 51 and subchapter III of chapter 53 of such title relating to classification and General Schedule pay rates, but no such specialist or expert shall be paid at a rate in excess of the maximum rate for GS–18 of the General Schedule under section 5330 of title 5.

(d) In carrying out his functions the Director shall assist and advise the President on policies and programs of the Federal Government affecting environmental quality by—

(1) Providing the professional and administrative staff and support for the Council on Environmental Quality established by Public Law 91–190;

(2) Assisting the Federal agencies and departments in appraising the effectiveness of existing and proposed facilities, programs, policies, and activities of the Federal Government, and those specific major projects designated by the President which do not require individual project authorization by Congress, which affect environmental quality;

(3) Reviewing the adequacy of existing systems for monitoring and predicting environmental changes in order to achieve effective coverage and efficient use of research facilities and other resources;

(4) Promoting the advancement of scientific knowledge of the effects of actions and technology on the environment and encourage the development of the means to prevent or reduce adverse effects that endanger the health and well-being of man;

(5) Asssisting in coordinating among the Federal departments and agencies those programs and activities which affect, protect, and improve environmental quality;

(6) Assisting the Federal departments and agencies in the development and interrelationship of environmental quality criteria and standards established through the Federal Government;

(7) Collecting, collating, analyzing, and interpreting data and information on environmental quality, ecological research, and evaluation.

(e) The Director is authorized to contract with public or private agencies, institutions, and organizations and with individuals without regard to sections 3618 and 3709 of the Revised Statutes (31 U.S.C. 529; 41 U.S.C. 5) in carrying out his functions.

### Report

SEC. 204. Each Environmental Quality Report required by Public Law 91–190 shall, upon transmittal to Congress, be referred to each standing committee having jurisdiction over any part of the subject matter of the Report.

### Authorization

SEC. 205. There are hereby authorized to be appropriated not to exceed $500,000 for the fiscal year ending June 30, 1970, not to exceed $750,000 for the fiscal year ending June 30, 1971, not to exceed $1,250,000 for the fiscal year ending June 30, 1972, and not to exceed $1,500,000 for the fiscal year ending June 30, 1973. These authorizations are in addition to those contained in Public Law 91–190.

Approved April 3, 1970.

APPENDIX D

# Preparation of Environmental Impact Statements: Guidelines*

On May 2, 1973, the Council on Environmental Quality published in the FEDERAL REGISTER, for public comment, a proposed revision of its guidelines for the preparation of environmental impact statements. Pursuant to the National Environmental Policy Act (P.L. 91–190, 42 U.S.C. 4321 et seq.) and Executive Order 11514 (35 FR 4247) all Federal departments, agencies, and establishments are required to prepare such statements in connection with their proposals for legislation and other major Federal actions significantly affecting the quality of the human environment. The authority for the Council's guidelines is set forth below in § 1500.1. The specific policies to be implemented by the guidelines is set forth below in § 1500.2.

The Council received numerous comments on its proposed guidelines from environmental groups, Federal, State, and local agencies, industry, and private individuals. Two general themes were presented in the majority of the comments. First, the Council should increase the opportunity for public involvement in the impact statement process. Second, the Council should provide more detailed guidance on the responsibilities of Federal agencies in light of recent court decisions interpreting the Act. The proposed guidelines have been revised in light of the specific comments relating to these general themes, as well as other comments received, and are now being issued in final form.

The guidelines will appear in the Code of Federal Regulations in Title 40, Chapter V, at Part 1500. They are being codified, in part, because they affect State and local governmental agencies, environmental groups, industry, and private individuals, in addition to Federal agencies, to which they are specifically directed, and the resultant need to make them widely and readily available.

Sec.

1500.1 Purpose and authority.
1500.2 Policy.
1500.3 Agency and OMB procedures.
1500.4 Federal agencies included; effect of the act on existing agency mandates.
1500.5 Types of actions covered by the act.
1500.6 Identifying major actions significantly affecting the environment.
1500.7 Preparing draft environmental statements; public hearings.
1500.8 Content of environmental statements.
1500.9 Review of draft environmental statements by Federal, Federal-State, and local agencies and by the public.
1500.10 Preparation and circulation of final environmental statements.
1500.11 Transmittal of statements to the Council; minimum periods for review; requests by the Council.

---

*38 Fed. Reg. 20550–20562, August 1, 1973.

1500.12 Legislative actions.
1500.13 Application of section 102(2)(C) procedure to existing projects and programs.
1500.14 Supplementary guidelines; evaluation of procedures.
Sec.

Appendix I Summary to accompany draft and final statements.

Appendix II Areas of environmental impact and Federal agencies and Federal State agencies with jurisdiction by law or special expertise to comment thereon.

Appendix III Offices within Federal agencies and Federal-State agencies for information regarding the agencies' NEPA activities and for receiving other agencies' impact statements for which comments are requested.

Appendix IV State and local agency review of impact statements.

AUTHORITY: National Environmental Act (P.L. 91-190, 42 U.S.C. 4321 et seq.) and Executive Order 11514.

### § 1500.1 Purpose and authority.

(a) This directive provides guidelines to Federal departments, agencies, and establishments for preparing detailed environmental statements on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment as required by section 102(2)(C) of the National Environmental Policy Act (P.L. 91-190, 42 U.S.C. 4321 et. seq.) (hereafter "the Act"). Underlying the preparation of such environmental statements is the mandate of both the Act and Executive Order 11514 (35 FR 4247) of March 5, 1970, that all Federal agencies, to the fullest extent possible, direct their policies, plans and programs to protect and enhance environmental quality. Agencies are required to view their actions in a manner calculated to encourage productive and enjoyable harmony between man and his environment, to promote efforts preventing or eliminating damage to the environment and biosphere and stimulating the health and welfare of man, and to enrich the understanding of the ecological systems and natural resources important to the Nation. The objective of section 102(2)(C) of the Act and of these guidelines is to assist agencies in implementing these policies. This requires agencies to build into their decisionmaking process, beginning at the earliest possible point, an appropriate and careful consideration of the environmental aspects of proposed action in order that adverse environmental effects may be avoided or minimized and environmental quality previously lost may be restored. This directive also provides guidance to Federal, State, and local agencies and the public in commenting on statements prepared under these guidelines.

(b) Pursuant to section 204(3) of the Act the Council on Environmental Quality (hereafter "the Council") is assigned the duty and function of reviewing and appraising the programs and activities of the Federal Government, in the light of the Act's policy, for the purpose of determining the extent to which such programs and activities are contributing to the achievement of such policy, and to make recommendations to the President with respect thereto. Section 102(2)(B) of the Act directs all Federal agencies to identify and develop methods and procedures, in consultation with the Council, to insure that unquantified environmental values be given appropriate consideration in decisionmaking along with economic and technical considerations; section 102(2)(C) of the Act directs that copies of all environmental impact statements be filed with the Council; and section 102(2)(H) directs all Federal agencies to assist the Council in the performance of its functions. These provisions have been supplemented in sections 3(h) and (i) of Executive Order 11514 by directions that the Council issue guidelines to Federal agencies for preparation of environmental impact statements and such other instructions to agencies and requests for reports and information as may be required to carry out the Council's responsibilities under the Act.

### § 1500.2 Policy.

(a) As early as possible and in all cases prior to agency decision concerning recommendations or favorable reports on proposals for (1) legislation significantly affecting the quality of the human environment (see §§ 1500.5(i) and 1500.12) (hereafter "legislative actions") and (2) all other major Federal actions significantly affecting the quality of the human environment (hereafter "administrative actions"), Federal agencies will, in consultation with other appropriate Federal, State and local agencies and the public assess in detail the potential environmental impact.

(b) Initial assessments of the environmental impacts of proposed action should be undertaken concurrently with initial technical and economic studies and, where required, a draft environmental impact statement prepared and circulated for comment in time to accompany the proposal through the existing agency review processes for such action. In this process, Federal agencies shall:

(1) Provide for circulation of draft environmental statements to other Federal, State, and local agencies and for their availability to the public in accordance with the provisions of these guidelines; (2) consider the comments of the agencies and the public; and (3) issue final environmental impact statements responsive to the comments received. The purpose of this assessment and consultation process is to provide agencies and other decisionmakers as well as members of the public with an understanding of the potential environmental effects of proposed actions, to avoid or minimize adverse effects wherever possible, and to restore or enhance environmental quality to the fullest extent practicable. In particular, agencies should use the environmental impact statement process to explore alternative actions that will avoid or minimize adverse impacts and to evaluate both the long- and short-range implications of proposed actions to man, his physical and social surroundings, and to nature. Agencies should consider the results of their environmental assessments along with their assessments of the net economic, technical and other benefits of proposed actions and use all practicable means, consistent with other essential considerations of national policy, to restore environmental quality as well as to avoid or minimize undesirable consequences for the environment.

### § 1500.3 Agency and OMB procedures.

(a) Pursuant to section 2(f) of Executive Order 11514, the heads of Federal agencies have been directed to proceed with measures required by section 102(2)(C) of the Act. Previous guidelines of the Council directed each agency to establish its own formal procedures for (1) identifying those agency actions requiring environmental statements, the appropriate time prior to decision for the consultations required by section 102(2)(C) and the agency review process for which environmental statements are to be available, (2) obtaining information required in their preparation, (3) designating the officials who are to be responsible for the statements, (4) consulting with and taking account of the comments of appropriate Federal, State and local agencies and the public, including obtaining the comment of the Administrator of the Environmental Protection Agency when required under section 309 of the Clean Air Act, as amended, and (5) meeting the requirements of section 2(b) of Executive Order 11514 for providing timely public information on Federal plans and programs with environmental impact. Each agency, including both departmental and subdepartmental components having such procedures, shall review its procedures and shall revise them, in consultation with the Council, as may be necessary in order to respond to requirements imposed by these revised guidelines as well as by such previous directives. After such consultation, proposed revisions of such agency procedures shall be published in the FEDERAL REGISTER no later than October 30, 1973. A minimum 45-day period for public comment shall be provided, followed by publication of final procedures no later than forty-five (45) days after the conclusion of the comment period. Each agency shall submit seven (7) copies of all such procedures to the Council. Any future revision of such agency procedures shall similarly be proposed and adopted only after prior consultation with the Council and, in the case of substantial revision, opportunity for public comment. All revisions shall be published in the FEDERAL REGISTER.

(b) Each Federal agency should consult, with the assistance of the Council and the Office of Management and Budget if desired, with other appropriate Federal agencies in the development and revision of the above procedures so as to achieve consistency in dealing with similar activities and to assure effective coordination among agencies in their review of proposed activities. Where applicable, State and local review of such agency procedures should be conducted pursuant to procedures established by Office of Management and Budget Circular No. A-85.

(c) Existing mechanisms for obtaining the views of Federal, State, and local agencies on proposed Federal actions should be utilized to the maximum extent practicable in dealing with environmental matters. The Office of Management and Budget will issue instructions, as necessary, to take full advantage of such existing mechanisms.

### § 1500.4 Federal agencies included; effect of the Act on existing agency mandates.

(a) Section 102(2)(C) of the Act applies to all agencies of the Federal Government. Section 102 of the Act provides that "to the fullest extent possible: (1) The policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this Act," and section 105 of the Act provides that "the policies and goals set forth in this Act are supplementary to those set forth in existing authorizations of Federal agencies." This means that each agency shall interpret the provisions of the Act as a supplement to its existing authority and as a mandate to view traditional policies and missions in the light of the Act's national environmental objectives. In accordance with this purpose, agencies should continue to review their policies, procedures, and regulations and to revise them as necessary to ensure full compliance with the purposes and provisions of the Act. The phrase "to the fullest extent possible" in section 102 is meant to make clear that each agency of the Federal Government shall comply with that section unless existing law applicable to the agency's operations expressly prohibits or makes compliance impossible.

### § 1500.5 Types of actions covered by the Act.

(a) "Actions" include but are not limited to:

(1) Recommendations or favorable reports relating to legislation including requests for appropriations. The requirement for following the section 102 (2)(C) procedure as elaborated in these guidelines applies to both (i) agency recommendations on their own proposals for legislation (see § 1500.12); and (ii) agency reports on legislation initiated elsewhere. In the latter case only the agency which has primary responsibility for the subject matter involved will prepare an environmental statement.

(2) New and continuing projects and program activities: directly undertaken by Federal agencies; or supported in whole or in part through Federal contracts, grants, subsidies, loans, or other forms of funding assistance (except where such assistance is solely in the form of general revenue sharing funds, distributed under the State and Local Fiscal Assistance Act of 1972, 31 U.S.C. 1221 et. seq. with no Federal agency control over the subsequent use of such funds); or involving a Federal lease, permit, license certificate or other entitlement for use.

(3) The making, modification, or establishment of regulations, rules, procedures, and policy.

### § 1500.6 Identifying major actions significantly affecting the environment.

(a) The statutory clause "major Federal actions significantly affecting the quality of the human environment" is to be construed by agencies with a view to the overall, cumulative impact of the action proposed, related Federal actions and projects in the area, and further actions contemplated. Such actions may be localized in their impact, but if there is potential that the environment may be significantly affected, the statement is to be prepared. Proposed major actions, the enviornmental impact of which is likely to be highly controversial, should be covered in all cases. In considering what constitutes major action significantly affecting the environment, agencies should bear in mind that the effect of many Federal decisions about a project or complex of projects can be individually limited but cumulatively considerable. This can occur when one or more agencies over a period of years puts into a project individually minor but collectively major resources, when one decision involving a limited amount of money is a precedent for action in much larger cases or represents a decision in principle about a future major course of action, or when several Government agencies individually make decisions about partial aspects of a major action. In all such cases, an environmental statement should be prepared if it is reasonable to anticipate a cumulatively significant impact on the environment from Federal action. The Council, on the basis of a written assessment of the impacts involved, is available to assist agencies in determining whether specific actions require impact statements.

(b) Section 101(b) of the Act indicates the broad range of aspects of the environment to be surveyed in any assessment of significant effect. The Act also indicates that adverse significant effects include those that degrade the quality of the environment, curtail the range of beneficial uses of the environment, and serve short-term, to the disadvantage of long-term, environmental goals. Significant effects can also include actions which may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial. Significant effects also include secondary effects, as described more fully, for example, in § 1500.8(a)(iii)(B). The significance of a proposed action may also vary with the setting, with the result that an action that would have little impact in an urban area may be significant in a rural setting or vice versa. While a precise definition of environmental "significance," valid in all contexts, is not possible, effects to be considered in assessing significance include, but are not limited to, those outlined in Appendix II of these guidelines.

(c) Each of the provisions of the Act, except section 102(2)(C), applies to all Federal agency actions. Section 102(2)(C) requires the preparation of a detailed environmental impact statement in the case of "major Federal actions significantly affecting the quality of the human environment." The identification of major actions significantly affecting the environment is the responsibility of each Federal agency, to be carried out against the background of its own particular operations. The action must be a (1) "major" action, (2) which is a "Federal action," (3) which has a "significant" effect, and (4) which involves the "quality of the human environment." The words "major" and "significantly" are intended to imply thresholds of importance and impact that must be met before a statement is required. The action causing the impact must also be one where there is sufficient Federal control and responsibility to constitute "Federal action" in contrast to cases where such Federal control and responsibility are not present as, for example, when Federal funds are distributed in the form of general revenue sharing to be used by State and local governments (see § 1500.5(ii)). Finally, the action must be one that significantly affects the quality of the human environment either by directly affecting human beings or by indirectly affecting human beings through adverse effects on the environment. Each agency should review the typical classes of actions that it undertakes and, in consultation with the Council, should develop specific criteria and methods for identifying those actions likely to require environmental statements and those actions likely not to require environmental statements. Normally this will involve:

(i) Making an initial assessment of the environmental impacts typically associated with principal types of agency action.

(ii) Identifying on the basis of this assessment, types of actions which normally do, and types of actions which normally do not, require statements.

(iii) With respect to remaining actions that may require statements depending on the circumstances, and those actions determined under the preceding paragraph (C)(4)(ii) of this section as likely to require statements, identifying: (*a*) what basic information needs to be gathered; (*b*) how and when such information is to be assembled and analyzed; and (*c*) on what bases environmental assessments and decisions to prepare impact statements will be made. Agencies may either include this substantive guidance in the procedures issued pursuant to § 1500.3(a) of these guidelines, or issue such guidance as supplemental instructions to aid relevant agency personnel in implementing the impact statement process. Pursuant to § 1500.14 of these guidelines, agencies shall report to the Council by June 30, 1974, on the progress made in developing such substantive guidance.

(d) (1) Agencies should give careful attention to identifying and defining the purpose and scope of the action which would most appropriately serve as the subject of the statement. In many cases, broad program statements will be required in order to assess the environmental effects of a number of individual actions on a given geographical area (e.g., coal leases), or environmental impacts that are generic or common to a series of agency actions (e.g., maintenance or waste handling practices), or the overall impact of a large-scale program or chain of contemplated projects (e.g., major lengths of highway as opposed to small segments). Subsequent statements on major individual actions will be necessary where such actions have significant environmental impacts not adequately evaluated in the program statement.

(2) Agencies engaging in major technology research and development programs should develop procedures for periodic evaluation to determine when a program statement is required for such programs. Factors to be considered in making this determination include the magnitude of Federal investment in the program, the likelihood of widespread application of the technology, the degree of environmental impact which would occur if the technology were widely applied, and the extent to which continued investment in the new technology is likely to restrict future alternatives. Statements must be written late enough in the development process to contain meaningful information, but early enough so that this information can practically serve as an input in the decision-making process. Where it is anticipated that a statement may ultimately be required but that its preparation is still premature, the agency should prepare an evaluation briefly setting forth the reasons for its determination that a statement is not yet necessary. This evaluation should be periodically updated, particularly when significant new information becomes available concerning the

potential environmental impact of the program. In any case, a statement must be prepared before research activities have reached a stage of investment or commitment to implementation likely to determine subsequent development or restrict later alternatives. Statements on technology research and development programs should include an analysis not only of alternative forms of the same technology that might reduce any adverse environmental impacts but also of alternative technologies that would serve the same function as the technology under consideration. Efforts should be made to involve other Federal agencies and interested groups with relevant expertise in the preparation of such statements because the impacts and alternatives to be considered are likely to be less well defined than in other types of statements.

(e) In accordance with the policy of the Act and Executive Order 11514 agencies have a responsibility to develop procedures to insure the fullest practicable provision of timely public information and understanding of Federal plans and programs with environmental impact in order to obtain the views of interested parties. In furtherance of this policy, agency procedures should include an appropriate early notice system for informing the public of the decision to prepare a draft environmental statement on proposed administrative actions (and for soliciting comments that may be helpful in preparing the statement) as soon as is practicable after the decision to prepare the statement is made. In this connection, agencies should: (1) maintain a list of administrative actions for which environmental statements are being prepared; (2) revise the list at regular intervals specified in the agency's procedures developed pursuant to § 1500.3(a) of these guidelines (but not less than quarterly) and transmit each such revision to the Council; and (3) make the list available for public inspection on request. The Council will periodically publish such lists in the Federal Register. If an agency decides that an environmental statement is not necessary for a proposed action (i) which the agency has identified pursuant to § 1500.6(c)(4)(ii) as normally requiring preparation of a statement, (ii) which is similar to actions for which the agency has prepared a significant number of statements, (iii) which the agency has previously announced would be the subject of a statement, or (iv) for which the agency has made a negative determination in response to a request from the Council pursuant to § 1500.11(f), the agency shall prepare a publicly available record briefly setting forth the agency's decision and the reasons for that determination. Lists of such negative determinations, and any evaluations made pursuant to § 1500.6 which conclude that preparation of a statement is not yet timely, shall be prepared and made available in the same manner as provided in this subsection for lists of statements under preparation.

### § 1500.7 Preparing draft environmental statements; public hearings.

(a) Each environmental impact statement shall be prepared and circulated in draft form for comment in accordance with the provisions of these guidelines. The draft statement must fulfill and satisfy to the fullest extent possible at the time the draft is prepared the requirements established for final statements by section 102(2)(C). (Where an agency has an established practice of declining to favor an alternative until public comments on a proposed action have been received, the draft environmental statement may indicate that two or more alternatives are under consideration.) Comments received shall be carefully evaluated and considered in the decision process. A final statement with substantive comments attached shall then be issued and circulated in accordance with applicable provisions of §§ 1500.10, 1500.11, or 1500.12. It is important that draft environmental statements be prepared and circulated for comment and furnished to the Council as early as possible in the agency review process in order to permit agency decisionmakers and outside reviewers to give meaningful consideration to the environmental issues involved. In particular, agencies should keep in mind that such statements are to serve as the means of assessing the environmental impact of proposed agency actions, rather than as a justification for decisions already made. This means that draft statements on administrative actions should be prepared and circulated for comment prior to the first significant point of decision in the agency review process. For major categories of agency action, this point should be identified in the procedures issued pursuant to § 1500.3(a). For major categories of projects involving an applicant and identified pursuant to § 1500.6(c)(c)(ii) as normally requiring the preparation of a statement, agencies should include in their procedures provisions limiting actions which an applicant is permitted to take prior to completion and review of the final statement with respect to his application.

(b) Where more than one agency (1) directly sponsors an action, or is directly involved in an action through funding, licenses, or permits, or (2) is involved in a group of actions directly related to each other because of their functional interdependence and geographical proximity, consideration should be given to preparing one statement for all the Federal actions involved (see § 1500.6(d)(1)). Agencies in such cases should consider the possibility of joint preparation of a statement by all agencies concerned, or designation of a single "lead agency" to assume supervisory responsibility for preparation of the statement. Where a lead agency prepares the statement, the other agencies involved should provide assistance with respect to their areas of jurisdiction and expertise. In either case, the statement should contain an environmental assessment of the full range of Federal actions involved, should reflect the views of all participating agencies, and should be prepared before major or irreversible actions have been taken by any of the participating agencies. Factors relevant in determining an appropriate lead agency include the time sequence in which the agencies become involved, the magnitude of their respective involvement, and their relative expertise with respect to the project's environmental effects. As necessary, the Council will assist in resolving questions of responsibility for statement preparation in the case of multi-agency actions. Federal Regional Councils, agencies and the public are encouraged to bring to the attention of the Council and other relevant agencies appropriate situations where a geographic or regionally focused statement would be desirable because of the cumulative environmental effects likely to result from multi-agency actions in the area.

(c) Where an agency relies on an applicant to submit initial environmental information, the agency should assist the applicant by outlining the types of information required. In all cases, the agency should make its own evaluation of the environmental issues and take responsibility for the scope and content of draft and final environmental statements.

(d) Agency procedures developed pursuant to § 1500.3(a) of these guidelines should indicate as explicitly as possible those types of agency decisions or actions which utilize hearings as part of the normal agency review process, either as a result of statutory requirement or agency practice. To the fullest extent possible, all such hearings shall include consideration of the environmental aspects of the proposed action. Agency procedures shall also specifically include provision for public hearings on major actions with environmental impact, whenever appropriate, and for providing the public with relevant information, including information on alternative courses of action. In deciding whether a public hearing is appropriate, an agency should consider: (1) The magnitude of the proposal in terms of economic costs, the geographic area involved, and the uniqueness or size of commitment of the resources involved; (2) the degree of interest in the proposal, as evidenced by requests from the public and from Federal, State and local authorities that a hearing be held; (3) the complexity of the issue and the likelihood that information will be presented at the hearing which will be of assistance to the agency in fulfilling its responsibilities under the Act; and (4) the extent to which public involvement already has been achieved through other means, such as earlier public hearings, meetings with citizen representatives, and/or written comments on the proposed action. Agencies should make any draft environmental statements to be issued available to the public at least fifteen (15) days prior to the time of such hearings.

### § 1500.8 Content of environmental statements.

(a) The following points are to be covered:

(1) A description of the proposed action, a statement of its purposes, and a description of the environment affected, including information, summary technical data, and maps and diagrams where relevant, adequate to permit an assessment of potential environmental impact by commenting agencies and the public. Highly technical and specialized analyses and data should be avoided in the body of the draft impact statement. Such materials should be attached as appendices or footnoted with adequate bibliographic references. The statement should also succinctly describe the environment of the area affected as it exists prior to a proposed action, including other Federal activities in the area affected by the proposed action which are related to the proposed action. The interrelationships and cumulative environmental impacts of the proposed action and other related Federal projects shall be presented in the statement. The amount of detail provided in such descriptions should be commensurate with the extent and expected impact of the

action, and with the amount of information required at the particular level of decisionmaking (planning, feasibility, design, etc.). In order to ensure accurate descriptions and environmental assessments, site visits should be made where feasible. Agencies should also take care to identify, as appropriate, population and growth characteristics of the affected area and any population and growth assumptions used to justify the project or program or to determine secondary population and growth impacts resulting from the proposed action and its alternatives (see paragraph (a)(1)(3)(ii), of this section). In discussing these population aspects, agencies should give consideration to using the rates of growth in the region of the project contained in the projection compiled for the Water Resources Council by the Bureau of Economic Analysis of the Department of Commerce and the Economic Research Service of the Department of Agriculture (the "OBERS" projection). In any event it is essential that the sources of data used to identify, quantify or evaluate any and all environmental consequences be expressly noted.

(2) The relationship of the proposed action to land use plans, policies, and controls for the affected area. This requires a discussion of how the proposed action may conform or conflict with the objectives and specific terms of approved or proposed Federal, State, and local land use plans, policies, and controls, if any, for the area affected including those developed in response to the Clean Air Act or the Federal Water Pollution Control Act Amendments of 1972. Where a conflict or inconsistency exists, the statement should describe the extent to which the agency has reconciled its proposed action with the plan, policy or control, and the reasons why the agency has decided to proceed notwithstanding the absence of full reconciliation.

(3) The probable impact of the proposed action on the environment.

(i) This requires agencies to assess the positive and negative effects of the proposed action as it affects both the national and international environment. The attention given to different environmental factors will vary according to the nature, scale, and location of proposed actions. Among factors to consider should be the potential effect of the action on such aspects of the environment as those listed in Appendix II of these guidelines. Primary attention should be given in the statement to discussing those factors most evidently impacted by the proposed action.

(ii) Secondary or indirect, as well as primary or direct, consequences for the environment should be included in the analysis. Many major Federal actions, in particular those that involve the construction or licensing of infrastructure investments (e.g., highways, airports, sewer systems, water resource projects, etc.), stimulate or induce secondary effects in the form of associated investments and changed patterns of social and economic activities. Such secondary effects, through their impacts on existing community facilities and activities, through inducing new facilities and activities, or through changes in natural conditions, may often be even more substantial than the primary effects of the original action itself. For example, the effects of the proposed action on population and growth may be among the more significant secondary effects. Such population and growth impacts should be estimated if expected to be significant (using data identified as indicated in § 1500.8(a)(1)) and an assessment made of the effect of any possible change in population patterns or growth upon the resource base, including land use, water, and public services, of the area in question.

(4) Alternatives to the proposed action, including, where relevant, those not within the existing authority of the responsible agency. (Section 102(2)(D) of the Act requires the responsible agency to "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources"). A rigorous exploration and objective evaluation of the environmental impacts of all reasonable alternative actions, particularly those that might enhance environmental quality or avoid some or all of the adverse environmental effects, is essential. Sufficient analysis of such alternatives and their environmental benefits, costs and risks should accompany the proposed action through the agency review process in order not to foreclose prematurely options which might enhance environmental quality or have less detrimental effects. Examples of such alternatives include: the alternative of taking no action or of postponing action pending further study; alternatives requiring actions of a significantly different nature which would provide similar benefits with different environmental impacts (e.g., nonstructural alternatives to flood control programs, or mass transit alternatives to highway construction); alternatives related to different designs

or details of the proposed action which would present different environmental impacts (e.g., cooling ponds vs. cooling towers for a power plant or alternatives that will significantly conserve energy); alternative measures to provide for compensation of fish and wildlife losses, including the acquisition of land, waters, and interests therein. In each case, the analysis should be sufficiently detailed to reveal the agency's comparative evaluation of the environmental benefits, costs and risks of the proposed action and each reasonable alternative. Where an existing impact statement already contains such an analysis, its treatment of alternatives may be incorporated provided that such treatment is current and relevant to the precise purpose of the proposed action.

(5.) Any probable adverse environmental effects which cannot be avoided (such as water or air pollution, undesirable land use patterns, damage to life systems, urban congestion, threats to health or other consequences adverse to the environmental goals set out in section 101 (b) of the Act). This should be a brief section summarizing in one place those effects discussed in paragraph (a)(3) of this section that are adverse and unavoidable under the proposed action. Included for purposes of contrast should be a clear statement of how other avoidable adverse effects discussed in paragraph (a)(2) of this section will be mitigated.

(6) The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity. This section should contain a brief discussion of the extent to which the proposed action involves tradeoffs between short-term environmental gains at the expense of long-term losses, or vice versa; and a discussion of the extent to which the proposed action forecloses future options. In this context short-term and long-term do not refer to any fixed time periods, but should be viewed in terms of the environmentally significant consequences of the proposed action.

(7) Any irreversible and irretrievable commitments of resources that would be involved in the proposed action should it be implemented. This requires the agency to identify from its survey of unavoidable impacts in paragraph (a)(5) of this section the extent to which the action irreversibly curtails the range of potential uses of the environment. Agencies should avoid construing the term "resources" to mean only the labor and materials devoted to an action. "Resources" also means the natural and cultural resources committed to loss or destruction by the action.

(8) An indication of what other interests and considerations of Federal policy are thought to offset the adverse environmental effects of the proposed action identified pursuant to paragraphs (a)(3) and (5) of this section. The statement should also indicate the extent to which these stated countervailing benefits could be realized by following reasonable alternatives to the proposed action (as identified in paragraph (a)(4) of this section) that would avoid some or all of the adverse environmental effects. In this connection, agencies that prepare cost-benefit analyses of proposed actions should attach such analyses, or summaries thereof, to the environmental impact statement, and should clearly indicate the extent to which environmental costs have not been reflected in such analyses.

(b) In developing the above points agencies should make every effort to convey the required information succinctly in a form easily understood, both by members of the public and by public decisionmakers, giving attention to the substance of the information conveyed rather than to the particular form, or length, or detail of the statement. Each of the above points, for example, need not always occupy a distinct section of the statement if it is otherwise adequately covered in discussing the impact of the proposed action and its alternatives—which items should normally be the focus of the statement. Draft statements should indicate at appropriate points in the text any underlying studies, reports, and other information obtained and considered by the agency in preparing the statement including any cost-benefit analyses prepared by the agency, and reports of consulting agencies under the Fish and Wildlife Coordination Act, 16 U.S.C. 661 et seq., and the National Historic Preservation Act of 1966, 16 U.S.C. 470 et seq., where such consultation has taken place. In the case of documents not likely to be easily accessible (such as internal studies or reports), the agency should indicate how such information may be obtained. If such information is attached to the statement, care should be taken to ensure that the statement remains an essentially self-contained instrument, capable of being understood by the reader without the need for undue cross reference.

(c) Each environmental statement should be prepared in accordance with the precept in section 102(2)(A) of the Act that all agencies of the Federal Government "utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and decisionmaking which may have an impact on man's environment." Agencies should attempt to have relevant disciplines represented on their own staffs; where this is not feasible they should make appropriate use of relevant Federal, State, and local agencies or the professional services of universities and outside consultants. The interdisciplinary approach should not be limited to the preparation of the environmental impact statement, but should also be used in the early planning stages of the proposed action. Early application of such an approach should help assure a systematic evaluation of reasonable alternative courses of action and their potential social, economic, and environmental consequences.

(d) Appendix I prescribes the form of the summary sheet which should accompany each draft and final environmental statement.

### § 1500.9 Review of draft environmental statements by Federal, Federal-State, State, and local agencies and by the public.

(a) *Federal agency review.* (1) *In general.* A Federal agency considering an action requiring an environmental statement should consult with, and (on the basis of a draft environmental statement for which the agency takes responsibility) obtain the comment on the environmental impact of the action of Federal and Federal-State agencies with jurisdiction by law or special expertise with respect to any environmental impact involved. These Federal and Federal-State agencies and their relevant areas of expertise include those identified in Appendices II and III to these guidelines. It is recommended that the listed departments and agencies establish contact points, which may be regional offices, for providing comments on the environmental statements. The requirement in section 102(2)(C) to obtain comment from Federal agencies having jurisdiction or special expertise is in addition to any specific statutory obligation of any Federal agency to coordinate or consult with any other Federal or State agency. Agencies should, for example, be alert to consultation requirements of the Fish and Wildlife Coordination Act, 16 U.S.C. 661 et seq., and the National Historic Preservation Act of 1966, 16 U.S.C. 470 et seq. To the extent possible, statements or findings concerning environmental impact required by other statutes, such as section 4(f) of the Department of Transportation Act of 1966, 49 U.S.C. 1653(f), or section 106 of the National Historic Preservation Act of 1966, should be combined with compliance with the environmental impact statement requirements of section 102(2)(C) of the Act to yield a single document which meets all applicable requirements. The Advisory Council on Historic Preservation, the Department of Transportation, and the Department of the Interior, in consultation with the Council, will issue any necessary supplementing instructions for furnishing information or findings not forthcoming under the environmental impact statement process.

(b) *EPA review.* Section 309 of the Clean Air Act, as amended (42 U.S.C. § 1857h-7), provides that the Administrator of the Environmental Protection Agency shall comment in writing on the environmental impact of any matter relating to his duties and responsibilities, and shall refer to the Council any matter that the Administrator determines is unsatisfactory from the standpoint of public health or welfare or environmental quality. Accordingly, wherever an agency action related to air or water quality, noise abatement and control, pesticide regulation, solid waste disposal, generally applicable environmental radiation criteria and standards, or other provision of the authority of the Administrator is involved, Federal agencies are required to submit such proposed actions and their environmental impact statements, if such have been prepared, to the Administrator for review and comment in writing. In all cases where EPA determines that proposed agency action is environmentally unsatisfactory, or where EPA determines that an environmental statement is so inadequate that such a determination cannot be made, EPA shall publish its determination and notify the Council as soon as practicable. The Administrator's comments shall constitute his comments for the purposes of both section 309 of the Clean Air Act and section 102(2)(C) of the National Environmental Policy Act.

(c) State and local review. Office of Management and Budget Circular No. A-95 (Revised) through its system of State and areawide clearinghouses provides a means for securnig the views of

State and local environmental agencies, which can assist in the preparation and review of environmental impact statements. Current instructions for obtaining the views of such agencies are contained in the joint OMB–CEQ memorandum attached to these guidelines as Appendix IV. A current listing of clearinghouses is issued periodically by the Office of Management and Budget.

(d) *Public review.* The procedures established by these guidelines are designed to encourage public participation in the impact statement process at the earliest possible time. Agency procedures should make provision for facilitating the comment of public and private organizations and individuals by announcing the availability of draft environmental statements and by making copies available to organizations and individuals that request an opportunity to comment. Agencies should devise methods for publicizing the existence of draft statements, for example, by publication of notices in local newspapers or by maintaining a list of groups, including relevant conservation commissions, known to be interested in the agency's activities and directly notifying such groups of the existence of a draft statement, or sending them a copy, as soon as it has been prepared. A copy of the draft statement should in all cases be sent to any applicant whose project is the subject of the statement. Materials to be made available to the public shall be provided without charge to the extent practicable, or at a fee which is not more than the actual cost of reproducing copies required to be sent to other Federal agencies, including the Council.

(e) *Responsibilities of commenting entities.* (1) Agencies and members of the public submitting comments on proposed actions on the basis of draft environmental statements should endeavor to make their comments as specific, substantive, and factual as possible without undue attention to matters of form in the impact statement. Although the comments need not conform to any particular format, it would assist agencies reviewing comments if the comments were organized in a manner consistent with the structure of the draft statement. Emphasis should be placed on the assessment of the environmental impacts of the proposed action, and the acceptability of those impacts on the quality of the environment, particularly as contrasted with the impacts of reasonable alternatives to the action. Commenting entities may recommend modifications to the proposed action and/or new alternatives that will enhance environmental quality and avoid or minimize adverse environmental impacts.

(2) Commenting agencies should indicate whether any of their projects not identified in the draft statement are sufficiently advanced in planning and related environmentally to the proposed action so that a discussion of the environmental interrelationships should be included in the final statement (see § 1500.8(a)(1)). The Council is available to assist agencies in making such determinations.

(3) Agencies and members of the public should indicate in their comments the nature of any monitoring of the environmental effects of the proposed project that appears particularly appropriate. Such monitoring may be necessary during the construction, startup, or operation phases of the project. Agencies with special expertise with respect to the environmental impacts involved are encouraged to assist the sponsoring agency in the establishment and operation of appropriate environmental monitoring.

(f) Agencies seeking comment shall establish time limits of not less than forty-five (45) days for reply, after which it may be presumed, unless the agency or party consulted requests a specified extension of time, that the agency or party consulted has no comment to make. Agencies seeking comment should endeavor to comply with requests for extensions of time of up to fifteen (15) days. In determining an appropriate period for comment, agencies should consider the magnitude and complexity of the statement and the extent of citizen interest in the proposed action.

### § 1500.10 Preparation and circulation of final environmental statements.

(a) Agencies should make every effort to discover and discuss all major points of view on the environmental effects of the proposed action and its alternatives in the draft statement itself. However, where opposing professional views and responsible opinion have been overlooked in the draft statement and are brought to the agency's attention through the commenting process, the agency should review the environmental effects of the action in light of those views and should make a meaningful reference in the final statement to the existence of any responsible opposing view not adequately discussed in the draft statement, indicating the agency's response to the issues raised. All substantive comments received on the draft (or summaries thereof where response has been exceptionally voluminous) should be attached to the final statement, whether or not each such comment is thought to merit individual discussion by the agency in the text of the statement.

(b) Copies of final statements, with comments attached, shall be sent to all Federal, State, and local agencies and private organizations that made substantive comments on the draft statement and to individuals who requested a copy of the final statement, as well as any applicant whose project is the subject of the statement. Copies of final statements shall in all cases be sent to the Environmental Protection Agency to assist it in carrying out its responsibilities under section 309 of the Clean Air Act. Where the number of comments on a draft statement is such that distribution of the final statement to all commenting entities appears impracticable, the agency shall consult with the Council concerning alternative arrangements for distribution of the statement.

### § 1500.11 Transmittal of statements to the Council; minimum periods for review; requests by the Council.

(a) As soon as they have been prepared, ten (10) copies of draft environmental statements, five (5) copies of all comments made thereon (to be forwarded to the Council by the entity making comment at the time comment is forwarded to the responsible agency), and ten (10) copies of the final text of environmental statements (together with the substance of all comments received by the responsible agency from Federal, State, and local agencies and from private organizations and individuals) shall be supplied to the Council. This will serve to meet the statutory requirement to make environmental statements available to the President. At the same time that copies of draft and final statements are sent to the Council, copies should also be sent to relevant commenting entities as set forth in §§ 1500.9 and 1500.10(b) of these guidelines.

(b) To the maximum extent practicable no administrative action subject to section 102(2)(C) is to be taken sooner than ninety (90) days after a draft environmental statement has been circulated for comment, furnished to the Council and, except where advance public disclosure will result in significantly increased costs of procurement to the Government, made available to the public pursuant to these guidelines; neither should such administrative action be taken sooner than thirty (30) days after the final text of an environmental statement (together with comments) has been made available to the Council, commenting agencies, and the public. In all cases, agencies should allot a sufficient review period for the final statement so as to comply with the statutory requirement that the "statement and the comments and views of appropriate Federal, State, and local agencies * * * accompany the proposal through the existing agency review processes." If the final text of an environmental statement is filed within ninety (90) days after a draft statement has been circulated for comment, furnished to the Council and made public pursuant to this section of these guidelines, the minimum thirty (30) day period and the ninety (90) day period may run concurrently to the extent that they overlap. An agency may at any time supplement or amend a draft or final environmental statement, particularly when substantial changes are made in the proposed action, or significant new information becomes available concerning its environmental aspects. In such cases the agency should consult with the Council with respect to the possible need for or desirability of recirculation of the statement for the appropriate period.

(c) The Council will publish weekly in the FEDERAL REGISTER lists of environmental statements received during the preceding week that are available for public comment. The date of publication of such lists shall be the date from which the minimum periods for review and advance availability of statements shall be calculated.

(d) The Council's publication of notice of the availability of statements is in addition to the agency's responsibility, as described in § 1500.9(d) of these guidelines, to insure the fullest practicable provision of timely public information concerning the existence and availability of environmental statements. The agency responsible for the environmental statement is also responsible for making the statement, the comments received, and any underlying documents available to the public pursuant to the provisions of the Freedom of Information Act (5 U.S.C., 552), without regard to the exclusion of intra- or interagency memoranda when such memoranda transmit comments of Federal agencies on the environmental impact of the proposed action pursuant to § 1500.9 of these guidelines. Agency procedures prepared pursuant to § 1500.3(a) of these guidelines shall implement these public information requirements and shall include arrangements for availability of environmental statements and comments at the head and appropriate regional offices of the responsible agency and at appropriate State and areawide clearinghouses unless the Governor of the State involved designates to the Council some other point for receipt of this information. Notice of such designation of an alternate point for receipt of this information will be included in the Office of Management and Budget listing of clearinghouses referred to in § 1500.9(c).

(e) Where emergency circumstances make it necessary to take an action with significant environmental impact without observing the provisions of these guidelines concerning minimum periods for agency review and advance availability of environmental statements, the Federal agency proposing to take the action should consult with the Council about alternative arrangements. Similarly where there are overriding considerations of expense to the Government or impaired program effectiveness, the responsible agency should consult with the Council concerning appropriate modifications of the minimum periods.

(f) In order to assist the Council in fulfilling its responsibilities under the Act and under Executive Order 11514, all agencies shall (as required by section 102(2)(H) of the Act and section 3(i) of Executive Order 11514) be responsive to requests by the Council for reports and other information dealing with issues arising in connection with the implementation of the Act. In particular, agencies shall be responsive to a request by the Council for the preparation and circulation of an environmental statement, unless the agency determines that such a statement is not required, in which case the agency shall prepare an environmental assessment and a publicly available record briefly setting forth the reasons for its determination. In no case, however, shall the Council's silence or failure to comment or request preparation, modification, or recirculation of an environmental statement or to take other action with respect to an environmental statement be construed as bearing in any way on the question of the legal requirement for or the adequacy of such statement under the Act.

### § 1500.12 Legislative actions.

(a) The Council and the Office of Management and Budget will cooperate in giving guidance as needed to assist agencies in identifying legislative items believed to have environmental significance. Agencies should prepare impact statements prior to submission of their legislative proposals to the Office of Management and Budget. In this regard, agencies should identify types of repetitive legislation requiring environmental impact statements (such as certain types of bills affecting transportation policy or annual construction authorizations).

(b) With respect to recommendations or reports on proposals for legislation to which section 102(2)(C) applies, the final text of the environmental statement and comments thereon should be available to the Congress and to the public for consideration in connection with the proposed legislation or report. In cases where the scheduling of congressional hearings on recommendations or reports on proposals for legislation which the Federal agency has forwarded to the Congress does not allow adequate time for the completion of a final text of an environmental statement (together with comments), a draft environmental statement may be furnished to the Congress and made available to the public pending transmittal of the comments as received and the final text.

### § 1500.13 Application of section 102(2)(C) procedure to existing projects and programs.

Agencies have an obligation to reassess ongoing projects and programs in order to avoid or minimize adverse environmental effects. The section 102(2)(C) procedure shall be applied to further major Federal actions having a significant effect on the environment even though they arise from projects or programs initiated prior to enactment of the Act on January 1, 1970. While the status of the work and degree of completion may be considered in determining whether to proceed with the project, it is essential that the environmental impacts of proceeding are reassessed pursuant to the Act's policies and procedures and, if the project or program is continued, that further incremental major actions be shaped so as to enhance and restore environmental quality as well as to avoid or minimize adverse environmental consequences. It is also important in further action that account be taken of environmental consequences not fully evaluated at the outset of the project or program.

### § 1500.14 Supplementary guidelines; evaluation of procedures.

(a) The Council after examining environmental statements and agency procedures with respect to such statements will issue such supplements to these guidelines as are necessary.

(b) Agencies will continue to assess their experience in the implementation of the section 102(2)(C) provisions of the Act and in conforming with these guidelines and report thereon to the Council by June 30, 1974. Such reports should include an identification of the problem areas and suggestions for revision or clarification of these guidelines to achieve effective coordination of views on environmental aspects (and alternatives, where appropriate) of proposed actions without imposing unproductive administrative procedures. Such reports shall also indicate what progress the agency has made in developing substantive criteria and guidance for making environmental assessments as required by § 1500.6(c) of this directive and by section 102(2)(B) of the Act.

*Effective date.* The revisions of these guidelines shall apply to all draft and final impact statements filed with the Council after January 28, 1974.

RUSSELL E. TRAIN,
*Chairman.*

## APPENDIX I—SUMMARY TO ACCOMPANY DRAFT AND FINAL STATEMENTS

(Check one) ( ) Draft. ( ) Final Environmental Statement.

Name of responsible Federal agency (with name of operating division where appropriate). Name, address, and telephone number of individual at the agency who can be contacted for additional information about the proposed action or the statement.

1. Name of action (Check one) ( ) Administrative Action. ( ) Legislative Action.

2. Brief description of action and its purpose. Indicate what States (and counties) particularly affected, and what other proposed Federal actions in the area, if any, are discussed in the statement.

3. Summary of environmental impacts and adverse environmental effects.

4. Summary of major alternatives considered.

5. (For draft statements) List all Federal, State, and local agencies and other parties from which comments have been requested. (For final statements) List all Federal, State, and local agencies and other parties from which written comments have been received.

6. Date draft statement (and final environmental statement, if one has been issued) made available to the Council and the public.

## APPENDIX II—AREAS OF ENVIRONMENTAL IMPACT AND FEDERAL AGENCIES AND FEDERAL STATE AGENCIES[1] WITH JURISDICTION BY LAW OR SPECIAL EXPERTISE TO COMMENT THEREON[2]

### AIR

### *Air Quality*

Department of Agriculture—
  Forest Service (effects on vegetation)
Atomic Energy Commission (radioactive substances)
Department of Health, Education, and Welfare
Environmental Protection Agency
Department of the Interior—
  Bureau of Mines (fossil and gaseous fuel combustion)
  Bureau of Sport Fisheries and Wildlife (effect on wildlife)
  Bureau of Outdoor Recreation (effects on recreation)
  Bureau of Land Management (public lands)
  Bureau of Indian Affairs (Indian lands)
National Aeronautics and Space Administration (remote sensing, aircraft emissions)
Department of Transportation—
  Assistant Secretary for Systems Development and Technology (auto emissions)
  Coast Guard (vessel emissions)
  Federal Aviation Administration (aircraft emissions)

### *Weather Modification*

Department of Agriculture—
  Forest Service
Department of Commerce—
  National Oceanic and Atmospheric Administration
Department of Defense—
  Department of the Air Force
Department of the Interior
  Bureau of Reclamation

### WATER RESOURCES COUNCIL

### WATER

### *Water Quality*

Department of Agriculture—
  Soil Conservation Service
  Forest Service
Atomic Energy Commission (radioactive substances)
Department of the Interior—
  Bureau of Reclamation
  Bureau of Land Management (public lands)
  Bureau of Indian Affairs (Indian lands)
  Bureau of Sports Fisheries and Wildlife
  Bureau of Outdoor Recreation
  Geological Survey
  Office of Saline Water
Environmental Protection Agency
Department of Health, Education, and Welfare

---

[1] River Basin Commissions (Delaware, Great Lakes, Missouri, New England, Ohio, Pacific Northwest, Souris-Red-Rainy, Susquehanna, Upper Mississippi) and similar Federal-State agencies should be consulted on actions affecting the environment of their specific geographic jurisdictions.

[2] In all cases where a proposed action will have significant international environmental effects, the Department of State should be consulted, and should be sent a copy of any draft and final impact statement which covers such action.

- Department of Defense—
  - Army Corps of Engineers
  - Department of the Navy (ship pollution control)
- National Aeronautics and Space Administration (remote sensing)
- Department of Transportation—
  - Coast Guard (oil spills, ship sanitation)
- Department of Commerce—
  - National Oceanic and Atmospheric Administration
- Water Resources Council
- River Basin Commissions (as geographically appropriate)

### *Marine Pollution, Commercial Fishery Conservation, and Shellfish Sanitation*

- Department of Commerce—
  - National Oceanic and Atmospheric Administration
- Department of Defense—
  - Army Corps of Engineers
  - Office of the Oceanographer of the Navy
- Department of Health, Education, and Welfare
- Department of the Interior—
  - Bureau of Sport Fisheries and Wildlife
  - Bureau of Outdoor Recreation
  - Bureau of Land Management (outer continental shelf)
  - Geological Survey (outer continental shelf)
- Department of Transportation—
  - Coast Guard
- Environmental Protection Agency
- National Aeronautics and Space Administration (remote sensing)
- Water Resources Council
- River Basin Commissions (as geographically appropriate)

### *Waterway Regulation and Stream Modification*

- Department of Agriculture—
  - Soil Conservation Service
- Department of Defense—
  - Army Corps of Engineers
- Department of the Interior—
  - Bureau of Reclamation
  - Bureau of Sport Fisheries and Wildlife
  - Bureau of Outdoor Recreation
  - Geological Survey
- Department of Transportation—
  - Coast Guard
- Environmental Protection Agency
- National Aeronautics and Space Administration (remote sensing)
- Water Resources Council
- River Basin Commissions (as geographically appropriate)

## FISH AND WILDLIFE

- Department of Agriculture—
  - Forest Service
  - Soil Conservation Service
- Department of Commerce—
  - National Oceanic and Atmospheric Administration (marine species)
- Department of the Interior—
  - Bureau of Sport Fisheries and Wildlife
  - Bureau of Land Management
  - Bureau of Outdoor Recreation
- Environmental Protection Agency

## SOLID WASTE

- Atomic Energy Commission (radioactive waste)
- Department of Defense—
  - Army Corps of Engineers
- Department of Health, Education, and Welfare
- Department of the Interior—
  - Bureau of Mines (mineral waste, mine acid waste, municipal solid waste, recycling)
  - Bureau of Land Management (public lands)
  - Bureau of Indian Affairs (Indian lands)
  - Geological Survey (geologic and hydrologic effects)
  - Office of Saline Water (demineralization)
- Department of Transportation—
  - Coast Guard (ship sanitation)
- Environmental Protection Agency
- River Basin Commissions (as geographically appropriate)
- Water Resources Council

## NOISE

- Department of Commerce—
  - National Bureau of Standards
- Department of Health, Education, and Welfare
- Department of Housing and Urban Development (land use and building materials aspects)
- Department of Labor—
  - Occupational Safety and Health Administration
- Department of Transportation—
  - Assistant Secretary for Systems Development and Technology
  - Federal Aviation Administration, Office of Noise Abatement
- Environmental Protection Agency
- National Aeronautics and Space Administration

## RADIATION

- Atomic Energy Commission
- Department of Commerce—
  - National Bureau of Standards
- Department of Health, Education, and Welfare
- Department of the Interior—
  - Bureau of Mines (uranium mines)
  - Mining Enforcement and Safety Administration (uranium mines)
- Environmental Protection Agency

## HAZARDOUS SUBSTANCES

### *Toxic Materials*

- Atomic Energy Commission (radioactive substances)
- Department of Agriculture—
  - Agricultural Research Service
  - Consumer and Marketing Service
- Department of Commerce—
  - National Oceanic and Atmospheric Administration
- Department of Defense
- Department of Health, Education, and Welfare
- Environmental Protection Agency

### *Food Additives and Contamination of Foodstuffs*

- Department of Agriculture—
  - Consumer and Marketing Service (meat and poultry products)
- Department of Health, Education, and Welfare
- Environmental Protection Agency

### *Pesticides*

- Department of Agriculture—
  - Agricultural Research Service (biological controls, food and fiber production)
  - Consumer and Marketing Service
  - Forest Service
- Department of Commerce—
  - National Oceanic and Atmospheric Administration
- Department of Health, Education, and Welfare
- Department of the Interior—
  - Bureau of Sport Fisheries and Wildlife (fish and wildlife effects)
  - Bureau of Land Management (public lands)
  - Bureau of Indian Affairs (Indian lands)
  - Bureau of Reclamation (irrigated lands)
- Environmental Protection Agency

### *Transportation and Handling of Hazardous Materials*

- Atomic Energy Commission (radioactive substances)
- Department of Commerce—
  - Maritime Administration
  - National Oceanic and Atmospheric Administration (effects on marine life and the coastal zone)
- Department of Defense—
  - Armed Services Explosive Safety Board
  - Army Corps of Engineers (navigable waterways)
- Department of Transportation—
  - Federal Highway Administration, Bureau of Motor Carrier Safety
  - Coast Guard
  - Federal Railroad Administration
  - Federal Aviation Administration
  - Assistant Secretary for Systems Development and Technology
  - Office of Hazardous Materials
  - Office of Pipeline Safety
- Environmental Protection Agency

## ENGERY SUPPLY AND NATURAL RESOURCES DEVELOPMENT

### *Electric Energy Development, Generation, and Transmission, and Use*

- Atomic Energy Commission (nuclear)
- Department of Agriculture—
  - Rural Electrification Administration (rural areas)
- Department of Defense—
  - Army Corps of Engineers (hydro)
- Department of Health, Education, and Welfare (radiation effects)
- Department of Housing and Urban Development (urban areas)
- Department of the Interior—
  - Bureau of Indian Affairs (Indian lands)
  - Bureau of Land Management (public lands)
  - Bureau of Reclamation
  - Power Marketing Administrations
  - Geological Survey
  - Bureau of Sport Fisheries and Wildlife
  - Bureau of Outdoor Recreation
  - National Park Service
- Environmental Protection Agency
- Federal Power Commission (hydro, transmission, and supply)
- River Basin Commissions (as geographically appropriate)
- Tennessee Valley Authority
- Water Resources Council

### *Petroleum Development, Extraction, Refining, Transport, and Use*

- Department of the Interior—
  - Office of Oil and Gas
  - Bureau of Mines
  - Geological Survey
  - Bureau of Land Management (public lands and outer continental shelf)
  - Bureau of Indian Affairs (Indian lands)
  - Bureau of Sport Fisheries and Wildlife (effects on fish and wildlife)
  - Bureau of Outdoor Recreation
  - National Park Service
- Department of Transportation (Transport and Pipeline Safety)
- Environmental Protection Agency
- Interstate Commerce Commission

### *Natural Gas Development, Production, Transmission, and Use*

- Department of Housing and Urban Development (urban areas)
- Department of the Interior—
  - Office of Oil and Gas
  - Geological Survey
  - Bureau of Mines
  - Bureau of Land Management (public lands)
  - Bureau of Indian Affairs (Indian lands)
  - Bureau of Sport Fisheries and Wildlife
  - Bureau of Outdoor Recreation
  - National Park Service
- Department of Transportation (transport and safety)
- Environmental Protection Agency
- Federal Power Commission (production, transmission, and supply)
- Interstate Commerce Commission

### *Coal and Minerals Development, Mining, Conversion, Processing, Transport, and Use*

- Appalachian Regional Commission
- Department of Agriculture—
  - Forest Service
- Department of Commerce
- Department of the Interior—
  - Office of Coal Research
  - Mining Enforcement and Safety Administration
  - Bureau of Mines
  - Geological Survey
  - Bureau of Indian Affairs (Indian lands)
  - Bureau of Land Management (public lands)
  - Bureau of Sport Fisheries and Wildlife
  - Bureau of Outdoor Recreation
  - National Park Service

- Department of Labor—
  - Occupational Safety and Health Administration
- Department of Transportation
- Environmental Protection Agency
- Interstate Commerce Commission
- Tennessee Valley Authority

### *Renewable Resource Development, Production, Management, Harvest, Transport, and Use*

- Department of Agriculture—
  - Forest Service
  - Soil Conservation Service
- Department of Commerce
- Department of Housing and Urban Development (building materials)
- Department of the Interior—
  - Geological Survey
  - Bureau of Land Management (public lands)
  - Bureau of Indian Affairs (Indian lands)
  - Bureau of Sport Fisheries and Wildlife
  - Bureau of Outdoor Recreation
  - National Park Service
- Department of Transportation
- Environmental Protection Agency
- Interstate Commerce Commission (freight rates)

### *Energy and Natural Resources Conservation*

- Department of Agriculture—
  - Forest Service
  - Soil Conservation Service
- Department of Commerce—
  - National Bureau of Standards (energy efficiency)
- Department of Housing and Urban Development—
  - Federal Housing Administration (housing standards)
- Department of the Interior—
  - Office of Energy Conservation
  - Bureau of Mines
  - Bureau of Reclamation
  - Geological Survey
  - Power Marketing Administration
- Department of Transportation
- Environmental Protection Agency
- Federal Power Commission
- General Services Administration (design and operation of buildings)
- Tennessee Valley Authority

## LAND USE AND MANAGEMENT

### *Land Use Changes, Planning and Regulation of Land Development*

- Department of Agricuture—
  - Forest Service (forest lands)
  - Agricultural Research Service (agricultural lands)
- Department of Housing and Urban Development
- Department of the Interior—
  - Office of Land Use and Water Planning
  - Bureau of Land Management (public la
  - Bureau of Land Management (public lands)
  - Bureau of Indian Affairs (Indian lands)
  - Bureau of Sport Fisheries and Wildlife (wildlife refuges)
  - Bureau of Outdoor Recreation (recreation lands)
  - National Park Service (NPS units)
- Department of Transportation
- Environmental Protection Agency (pollution effects)
- National Aeronautics and Space Administration (remote sensing)
- River Basins Commissions (as geographically appropriate).

### *Public Land Management*

- Department of Agriculture—
  - Forest Service (forests)
- Department of Defense
- Department of the Interior—
  - Bureau of Land Management
  - Bureau of Indian Affairs (Indian lands)
  - Bureau of Sport Fisheries and Wildlife (wildlife refuges)
  - Bureau of Outdoor Recreation (recreation lands)
  - National Park Service (NPS units)
- Federal Power Commission (project lands)
- General Services Administration
- National Aeronautics and Space Administration (remote sensing)
- Tennessee Valley Authority (project lands)

### PROTECTION OF ENVIRONMENTALLY CRITICAL AREAS—FLOODPLAINS, WETLANDS, BEACHES AND DUNES, UNSTABLE SOILS, STEEP SLOPES, AQUIFER RECHARGE AREAS, ETC.

- Department of Agriculture—
  - Agricultural Stabilization and Conservation Service
  - Soil Conservation Service
  - Forest Service
- Department of Commerce—
  - National Oceanic and Atmospheric Administration (coastal areas)
- Department of Defense—
  - Army Corps of Engineers
- Department of Housing and Urban Development (urban and floodplain areas)
- Department of the Interior—
  - Office of Land Use and Water Planning
  - Bureau of Outdoor Recreation
  - Bureau of Reclamation
  - Bureau of Sport Fisheries and Wildlife
  - Bureau of Land Management
  - Geological Survey
- Environmental Protection Agency (pollution effects)
- National Aeronautics and Space Administration (remote sensing)
- River Basins Commissions (as geographically appropriate)
- Water Resources Council

### LAND USE IN COASTAL AREAS

- Department of Agriculture—
  - Forest Service
  - Soil Conservation Service (soil stability, hydrology)
- Department of Commerce—
  - National Oceanic and Atmospheric Administration (impact on marine life and coastal zone management)
- Department of Defense—
  - Army Corps of Engineers (beaches, dredge and fill permits, Refuse Act permits)
- Department of Housing and Urban Development (urban areas)

- Department of the Interior—
  - Office of Land Use and Water Planning
  - Bureau of Sport Fisheries and Wildlife
  - National Park Service
  - Geological Survey
  - Bureau of Outdoor Recreation
  - Bureau of Land Management (public lands)
- Department of Transportation—
  - Coast Guard (bridges, navigation)
- Environmental Protection Agency (pollution effects)
- National Aeronautics and Space Administration (remote sensing)

### REDEVELOPMENT AND CONSTRUCTION IN BUILT-UP AREAS

- Department of Commerce—
  - Economic Development Administration (designated areas)
- Department of Housing and Urban Development
- Department of the Interior—
  - Office of Land Use and Water Planning
- Department of Transportation
- Environmental Protection Agency
- General Services Administration
- Office of Economic Opportunity

### DENSITY AND CONGESTION MITIGATION

- Department of Health, Education, and Welfare
- Department of Housing and Urban Development
- Department of the Interior—
  - Office of Land Use and Water Planning
  - Bureau of Outdoor Recreation
- Department of Transportation
- Environmental Protection Agency

### NEIGHBORHOOD CHARACTER AND CONTINUITY

- Department of Health, Education, and Welfare
- Department of Housing and Urban Development
- National Endowment for the Arts
- Office of Economic Opportunity

### IMPACTS ON LOW-INCOME POPULATIONS

- Department of Commerce—
  - Economic Development Administration (designated areas)
- Department of Health, Education, and Welfare
- Department of Housing and Urban Development
- Office of Economic Opportunity

### HISTORIC, ARCHITECTURAL, AND ARCHEOLOGICAL PRESERVATION

- Advisory Council on Historic Preservation
- Department of Housing and Urban Development
- Department of the Interior—
  - National Park Service
  - Bureau of Land Management (public lands)
  - Bureau of Indian Affairs (Indian lands)
- General Services Administration
- National Endowment for the Arts

### SOIL AND PLANT CONSERVATION AND HYDROLOGY

- Department of Agriculture—
  - Soil Conservation Service
  - Agricultural Service
  - Forest Service
- Department of Commerce—
  - National Oceanic and Atmospheric Administration
- Department of Defense—
  - Army Corps of Engineers (dredging, aquatic plants)
- Department of Health, Education, and Welfare
- Department of the Interior—
  - Bureau of Land Management
  - Bureau of Sport Fisheries and Wildlife
  - Geological Survey
  - Bureau of Reclamation
- Environmental Protection Agency
- National Aeronautics and Space Administration (remote sensing)
- River Basin Commissions (as geographically appropriate)
- Water Resources Council

### OUTDOOR RECREATION

- Department of Agriculture—
  - Forest Service
  - Soil Conservation Service
- Department of Defense—
  - Army Corps of Engineers
- Department of Housing and Urban Development (urban areas)
- Department of the Interior—
  - Bureau of Land Management
  - National Park Service
  - Bureau of Outdoor Recreation
  - Bureau of Sport Fisheries and Wildlife
  - Bureau of Indian Affairs
- Environmental Protection Agency
- National Aeronautics and Space Administration (remote sensing)
- River Basin Commissions (as geographically appropriate)
- Water Resources Council

## APPENDIX III—OFFICES WITHIN FEDERAL AGENCIES AND FEDERAL-STATE AGENCIES FOR INFORMATION REGARDING THE AGENCIES' NEPA ACTIVITIES AND FOR RECEIVING OTHER AGENCIES' IMPACT STATEMENTS FOR WHICH COMMENTS ARE REQUESTED

### ADVISORY COUNCIL ON HISTORIC PRESERVATION

Office of Architectural and Environmental Preservation, Advisory Council on Historic Preservation, Suite 430, 1522 K Street, N.W., Washington, D.C. 20005 254–3974

### DEPARTMENT OF AGRICULTURE

Office of the Secretary, Attn: Coordinator Environmental Quality Activities, U.S. Department of Agriculture, Washington, D.C. 20250 447–3965

---

[1] Requests for comments or information from individual units of the Department of Agriculture, e.g., Soil Conservation Service, Forest Service, etc. should be sent to the Office of the Secretary, Department of Agriculture, at the address given above.

### APPALACHIAN REGIONAL COMMISSION

Office of the Alternate Federal Co-Chairman, Appalachian Regional Commission, 1666 Connecticut Avenue, N.W., Washington, D.C. 20235 967-4103

### DEPARTMENT OF THE ARMY (CORPS OF ENGINEERS)

Executive Director of Civil Works, Office of the Chief of Engineers, U.S. Army Corps of Engineers, Washington, D.C. 20314 693-7168

### ATOMIC ENERGY COMMISSION

For nonregulatory matters: Office of Assistant General Manager for Biomedical and Environmental Research and Safety Programs, Atomic Energy Commission, Washington, D.C. 20545 973-3208

For regulatory matters: Office of the Assistant Director for Environmental Projects, Atomic Energy Commission, Washington, D.C. 20545 973-7531

### DEPARTMENT OF COMMERCE

Office of the Deputy Assistant Secretary for Environmental Affairs, U.S. Department of Commerce, Washington, D.C. 20230 967-4335

### DEPARTMENT OF DEFENSE

Office of the Assistant Secretary for Defense (Health and Environment), U.S. Department of Defense, Room 3E172, The Pentagon, Washington, D.C. 20301 697-2111

### DELAWARE RIVER BASIN COMMISSION

Office of the Secretary, Delaware River Basin Commission, Post Office Box 360, Trenton, N.J. 08603 (609) 883-9500

### ENVIRONMENTAL PROTECTION AGENCY [2]

Director, Office of Federal Activities, Environmental Protection Agency, 401 M Street, S.W., Washington, D.C. 20460 755-0777

---

[2] Contact the Office of Federal Activities for environmental statements concerning legislation, regulations, national program proposals or other major policy issues.

For all other EPA consultation, contact the Regional Administrator in whose area the proposed action (e.g., highway or water resource construction projects) will take place. The Regional Administrators will coordinate the EPA review. Addresses of the Regional Administrators, and the areas covered by their regions are as follows:

| | |
|---|---|
| Regional Administrator, I,<br>U.S. Environmental Protection Agency<br>Room 2303, John F. Kennedy<br>Federal Bldg., Boston, Mass. 02203,<br>(617) 223-7210 | Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont |
| Regional Administrator, II,<br>U.S. Environmental Protection Agency<br>Room 908, 26 Federal Plaza<br>New York, New York 10007<br>(212) 264-2525 | New Jersey, New York, Puerto Rico, Virgin Islands |
| Regional Administrator, III,<br>U.S. Environmental Protection Agency<br>Curtis Bldg., 6th & Walnut Sts.<br>Philadelphia, Pa. 19106<br>(215) 597-9801 | Delaware, Maryland, Pennsylvania, Virginia, West Virginia, District of Columbia |
| Regional Administrator, IV,<br>U.S. Environmental Protection Agency<br>1421 Peachtree Street<br>N.E., Atlanta, Ga. 30309<br>(404) 526-5727 | Alabama, Florida, Georgia, Kentucky Mississippi, North Carolina, South Carolina, Tennessee |
| Regional Administrator V,<br>U.S. Environmental Protection Agency<br>1 N. Wacker Drive<br>Chicago, Illinois 60606<br>(312) 353-5250 | Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin |
| Regional Administrator VI,<br>U.S. Environmental Protection Agency<br>1600 Patterson Street<br>Suite 1100<br>Dallas, Texas 75201<br>(214) 749-1962 | Arkansas, Louisiana, New Mexico, Texas, Oklahoma |
| Regional Administrator VII,<br>U.S. Environmental Protection Agency<br>1735 Baltimore Avenue<br>Kansas City, Missouri 64108<br>(816) 374-5493 | Iowa, Kansas, Missouri, Nebraska |

### FEDERAL POWER COMMISSION

Commission's Advisor on Environmental Quality, Federal Power Commission, 825 N. Capitol Street, N.E., Washington, D.C. 20426 386-6084

### GENERAL SERVICES ADMINISTRATION

Office of Environmental Affairs, Office of the Deputy Administrator for Special Projects, General Services Administration, Washington, D.C. 20405 343-4161

### GREAT LAKES BASIN COMMISSION

Office of the Chairman, Great Lakes Basin Commission, 3475 Plymouth Road, P.O. Box 999, Ann Arbor, Michigan 48105 (313) 769-7431

### DEPARTMENT OF HEALTH, EDUCATION AND WELFARE [3]

Office of Environmental Affairs, Office of the Assistant Secretary for Administration and Management, Department of Health, Education and Welfare, Washington, D.C. 20202 963-4456

| | |
|---|---|
| Regional Administrator VIII,<br>U.S. Environmental Protection Agency<br>Suite 900, Lincoln Tower<br>1860 Lincoln Street<br>Denver, Colorado 80203<br>(303) 837-3895 | Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming |
| Regional Administrator IX,<br>U.S. Environmental Protection Agency<br>100 California Street<br>San Francisco, California 94111<br>(415) 556-2320 | Arizona, California, Hawaii, Nevada, American Samoa, Guam, Trust Territories of Pacific Islands, Wake Island |
| Regional Administrator X,<br>U.S. Environmental Protection Agency<br>1200 Sixth Avenue<br>Seattle, Washington 98101<br>(206) 442-1220 | Alaska, Idaho, Oregon, Washington |

---

[3] Contact the Office of Environmental Affairs for information on HEW's environmental statements concerning legislation, regulations, national program proposals or other major policy issues, and for all requests for HEW comment on impact statements of other agencies.

For information with respect to HEW actions occurring within the jurisdiction of the Departments' Regional Directors, contact the appropriate Regional Environmental Officer:

Region I:
Regional Environmental Officer
U.S. Department of Health, Education and Welfare
Room 2007B
John F. Kennedy Center
Boston, Massachusetts 02203 (617) 223-6837

Region II:
Regional Environmental Officer
U.S. Department of Health, Education and Welfare
Federal Building
26 Federal Plaza
New York, New York 10007 (212) 264-1308

Region III:
Regional Environmental Officer
U.S. Department of Health, Education and Welfare
P.O. Box 13716
Philadelphia, Pennsylvania 19101 (215) 597-6498

Region IV:
Regional Environmental Officer
U.S. Department of Health, Education and Welfare
Room 404
50 Seventh Street, N.E.
Atlanta, Georgia 30323 (404) 526-5817

Region V:
Regional Environmental Officer
U.S. Department of Health, Education and Welfare
Room 712, New Post Office Building
433 West Van Buren Street
Chicago, Illinois 60607 (312) 353-1644

Region VI:
Regional Environmental Officer
U.S. Department of Health, Education and Welfare
1114 Commerce Street
Dallas, Texas 75202 (214) 749-2236

Region VII:
Regional Environmental Officer
U.S. Department of Health, Education and Welfare
601 East 12th Street
Kansas City, Missouri 64106 (816) 374-3584

Region VIII:
Regional Environmental Officer
U.S. Department of Health, Education and Welfare
9017 Federal Building
19th and Stout Streets
Denver, Colorado 80202 (303) 837-4178

Region IX:
Regional Environmental Officer
U.S. Department of Health, Education and Welfare
50 Fulton Street
San Francisco, California 94102 (415) 556-1970

Region X:
Regional Environmental Officer
U.S. Department of Health, Education and Welfare
Arcade Plaza Building
1321 Second Street
Seattle, Washington 98101 (206) 442-0490

### DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT [4]

Director, Office of Community and Environmental Standards, Department of Housing and Urban Development, Room 7206, Washington, D.C. 20410
755-5980

### DEPARTMENT OF THE INTERIOR [5]

Director, Office of Environmental Project Review, Department of the Interior, Interior Building, Washington, D.C. 20240 343-3291

### INTERSTATE COMMERCE COMMISSION

Office of Proceedings, Interstate Commerce, Commission, Washington, D.C. 20423
343-616

### DEPARTMENT OF LABOR

Assistant Secretary for Occupational Safety and Health, Department of Labor, Washington, D.C. 20210
961-3405

### MISSOURI RIVER BASINS COMMISSION

Office of the Chairman, Missouri River Basins Commission, 10050 Regency Circle, Omaha, Nebraska 68114
(402) 397-5714

### NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Office of the Comptroller, National Aeronautics and Space Administration, Washington, D.C. 20546
755-8440

### NATIONAL CAPITAL PLANNING COMMISSION

Office of Environmental Affairs, Office of the Executive Director, National Capital Planning Commission, Washington, D.C. 20576
382-7200

### NATIONAL ENDOWMENT FOR THE ARTS

Office of Architecture and Environmental Arts Program, National Endowment for the Arts, Washington, D.C. 20506
382-5765

### NEW ENGLAND RIVER BASINS COMMISSION

Office of the Chairman, New England River Basins Commission, 55 Court Street, Boston, Mass. 02108
(617) 223-6244

### OFFICE OF ECONOMIC OPPORTUNITY

Office of the Director, Office of Economic Opportunity, 1200 19th Street, N.W., Washington, D.C. 20506
254-6000

---

[4] Contact the Director with regard to environmental impacts of legislation, policy statements, program regulations and procedures, and precedent-making project decisions. For all other HUD consultation, contact the HUD Regional Administrator in whose jurisdiction the project lies, as follows:

Regional Administrator I,
  Environmental Clearance Officer
  U.S. Department of Housing and Urban Development
  Room 405, John F. Kennedy Federal Building
  Boston, Mass. 02203 (617) 223-4066

Regional Administrator II,
  Environmental Clearance Officer
  U.S. Department of Housing and Urban Development
  26 Federal Plaza
  New York, New York 10007 (212) 264-8068

Regional Administrator III,
  Environmental Clearance Officer
  U.S. Department of Housing and Urban Development
  Curtis Building, Sixth and Walnut Street
  Philadelphia, Pennsylvania 19106 (215) 597-2560

Regional Administrator IV,
  Environmental Clearance Officer
  U.S. Department of Housing and Urban Development
  Peachtree-Seventh Building
  Atlanta, Georgia 30323 (404) 526-5585

Regional Administrator V,
  Environmental Clearance Officer
  U.S. Department of Housing and Urban Development
  360 North Michigan Avenue
  Chicago, Illinois 60601 (312) 353-5680

Regional Administrator VI,
  Environmental Clearance Officer
  U.S. Department of Housing and Urban Development
  Federal Office Building, 819 Taylor Street
  Fort Worth, Texas 76102 (817) 334-2867

Regional Administrator VII,
  Environmental Clearance Officer
  U.S. Department of Housing and Urban Development
  911 Walnut Street
  Kansas City, Missouri 64106 (816) 374-2661

Regional Administrator VIII,
  Environmental Clearance Officer
  U.S. Department of Housing and Urban Development
  Samsonite Building, 1051 South Broadway
  Denver, Colorado 80209 (303) 837-4061

Regional Administrator IX,
  Environmental Clearance Officer
  U.S. Department of Housing and Urban Development
  450 Golden Gate Avenue, Post Office Box 36003
  San Francisco, California 94102 (415) 556-4752

Regional Administrator X,
  Environmental Clearance Officer
  U.S. Department of Housing and Urban Development
  Room 226, Arcade Plaza Building
  Seattle, Washington 98101 (206) 583-5415

[5] Requests for comments or information from individual units of the Department of the Interior should be sent to the Office of Environmental Project Review at the address given above.

### OHIO RIVER BASIN COMMISSION

Office of the Chairman, Ohio River Basin Commission, 38 East 4th Street, Suite 208-20, Cincinnati, Ohio 45202
(513) 684-3831

### PACIFIC NORTHWEST RIVER BASINS COMMISSION

Office of the Chairman, Pacific Northwest River Basins Commission, 1 Columbia River, Vancouver, Washington 98660
(206) 695-3606

### SOURIS-RED-RAINY RIVER BASINS COMMISSION

Office of the Chairman, Souris-Red-Rainy River Basins Commission, Suite 6, Professional Building, Holiday Mall, Moorhead, Minnesota 56560
(701) 237-5227

### DEPARTMENT OF STATE

Office of the Special Assistant to the Secretary for Environmental Affairs, Department of State, Washington, D.C. 20520
632-7964

### SUSQUEHANNA RIVER BASIN COMMISSION

Office of the Executive Director, Susquehanna River Basin Commission, 5012 Lenker Street, Mechanicsburg, Pa. 17055
(717) 737-0501

### TENNESSEE VALLEY AUTHORITY

Office of the Director of Environmental Research and Development, Tennessee Valley Authority, 720 Edney Building, Chattanooga, Tennessee 37401 (615) 755-2002

### DEPARTMENT OF TRANSPORTATION [6]

Director, Office of Environmental Quality, Office of the Assistant Secretary for Environment, Safety, and Consumer Affairs, Department of Transportation, Washington, D.C. 20590 426-4357

---

[6] Contact the Office of Environmental Quality, Department of Transportation, for information on DOT's environmental statements concerning legislation, regulations, national program proposals, or other major policy issues.

For information regarding the Department of Transportation's other environmental statements, contact the national office for the appropriate administration:

*U.S. Coast Guard*

Office of Marine Environment and Systems, U.S. Coast Guard, 400 7th Street, S.W., Washington, D.C. 20590, 426-2007

*Federal Aviation Administration*

Office of Environmental Quality, Federal Aviation Administration, 800 Independence Avenue, S.W., Washington, D.C. 20591, 426-8406

*Federal Highway Administration*

Office of Environmental Policy, Federal Highway Administration, 400 7th Street S.W., Washington, D.C. 20590, 426-0351

*Federal Railroad Administration*

Office of Policy and Plans, Federal Railroad Administration, 400 7th Street, S.W., Washington, D.C. 20590, 426-1567

*Urban Mass Transportation Administration*

Office of Program Operations, Urban Mass Transportation Administration, 400 7th Street, S.W., Washington, D.C. 20590, 426-4020

For other administration's not listed above, contact the Office of Environmental Quality, Department of Transportation, at the address given above.

For comments on other agencies' environmental statements, contact the appropriate administration's regional office. If more than one administration within the Department of Transportation is to be requested to comment, contact the Secretarial Representative in the appropriate Regional Office for coordination of the Department's comments:

SECRETARIAL REPRESENTATIVE

Region I Secretarial Representative, U.S. Department of Transportation, Transportation Systems Center, 55 Broadway, Cambridge, Massachusetts 02142 (617) 494-2709

Region II Secretarial Representative, U.S. Department of Transportation, 26 Federal Plaza, Room 1811, New York, New York 10007 (212) 264-2672

Region III Secretarial Representative, U.S. Department of Transportation, Mall Building, Suite 1214, 325 Chestnut Street, Philadelphia, Pennsylvania 19106 (215) 597-0407

Region IV Secretarial Representative, U.S. Department of Transportation, Suite 515, 1720 Peachtree Rd., N.W. Atlanta, Georgia 30309 (404) 526-3738

Region V Secretarial Representative, U.S. Department of Transportation, 17th Floor, 300 S. Wacker Drive, Chicago, Illinois 60606 (312) 353-4000

Region V Secretarial Representative, U.S. Department of Transportation, 9-C-18 Federal Center, 1100 Commerce Street, Dallas, Texas 75202 (214) 749-1851

Region VII Secretarial Representative, U.S. Department of Transportation, 601 E. 12th Street, Room 634, Kansas City, Missouri 64106 (816) 374-2761

Region VIII Secretarial Representative, U.S. Department of Transportation, Prudential Plaza, Suite 1822, 1050 17th Street, Denver, Colorado 80225 (303) 837-3242

Region IX Secretarial Representative, U.S. Department of Transportation, 450 Golden Gate Avenue, Box 36133, San Francisco, California 94102 (415) 556-5961

Region X Secretarial Representative, U.S. Department of Transportation, 1321 Second Avenue, Room 507, Seattle, Washington 98101 (206) 442-0590

FEDERAL AVIATION ADMINISTRATION

New England Region, Office of the Regional Director, Federal Aviation Administration, 154 Middlesex Street, Burlington, Massachusetts 01803 (617) 272-2350

DEPARTMENT OF THE TREASURY

Office of Assistant Secretary for Administration, Department of the Treasury, Washington, D.C. 20220 964–5391

UPPER MISSISSIPPI RIVER BASIN COMMISSION

Office of the Chairman, Upper Mississippi River Basin Commission, Federal Office Building, Fort Snelling, Twin Cities, Minnesota 55111 (612) 725–4690

WATER RESOURCES COUNCIL

Office of the Associate Director, Water Resources Council, 2120 L Street, N.W., Suite 800, Washington, D.C. 20037 254–6442

## APPENDIX IV—STATE AND LOCAL AGENCY REVIEW OF IMPACT STATEMENTS

1. OMB Circular No. A–95 through its system of clearinghouses provides a means for securing the views of State and local environ-

---

Eastern Region, Office of the Regional Director, Federal Aviation Administration, Federal Building, JFK International Airport, Jamaica, New York 11430 (212) 995–3333

Southern Region, Office of the Regional Director, Federal Aviation Administration, P.O. Box 20636, Atlanta, Georgia 30320 (404) 526–7222

Great Lakes Region, Office of the Regional Director, Federal Aviation Administration, 2300 East Devon, Des Plaines, Illinois 60018 (312) 694–4500

Southwest Region, Office of the Regional Director, Federal Aviation Administration, P.O. Box 1689, Fort Worth, Texas 76101 (817) 624–4911

Central Region, Office of the Regional Director, Federal Aviation Administration, 601 E. 12th Street, Kansas City, Missouri 64106 (816) 374–5626

Rocky Mountain Region, Office of the Regional Director, Federal Aviation Administration, Park Hill Station, P.O. Box 7213, Denver, Colorado 80207 (303) 837–3646

Western Region, Office of the Regional Director, Federal Aviation Administration, P.O. Box 92007, WorldWay Postal Center, Los Angeles, California 90009 (213) 536–6427

Northwest Region, Office of the Regional Director, Federal Aviation Administration, FAA Building, Boeing Field, Seattle, Washington 98108 (206) 767–2780

FEDERAL HIGHWAY ADMINISTRATION

Region 1, Regional Administrator, Federal Highway Administration, 4 Normanskill Boulevard, Delmar, New York 12054 (518) 472–6476

Region 3, Regional Administrator, Federal Highway Administration, Room 1621, George H. Fallon Federal Office Building, 31 Hopkins Plaza, Baltimore, Maryland 21201 (301) 962–2361

Region 4, Regional Administrator, Federal Highway Administration, Suite 200, 1720 Peachtree Road, N.W., Atlanta, Georgia 30309 (404) 526–5078

Region 5, Regional Administrator, Federal Highway Administration, Dixie Highway, Homewood, Illinois 60430 (312) 799–6300

Region 6, Regional Administrator, Federal Highway Administration, 819 Taylor Street, Fort Worth, Texas 76102 (817) 334–3232

Region 7, Regional Administrator, Federal Highway Administration, P.O. Box 7186, Country Club Station, Kansas City, Missouri 64113 (816) 361–7563

Region 8, Regional Administrator, Federal Highway Administration, Room 242, Building 40, Denver Federal Center, Denver, Colorado 80225

Region 9, Regional Administrator, Federal Highway Administration, 450 Golden Gate Avenue, Box 36096, San Francisco, California 94102 (415) 556–3895

Region 10, Regional Administrator, Federal Highway Administration, Room 412, Mohawk Building, 222 S.W. Morrison Street, Portland, Oregon 97204 (503) 221–2065

URBAN MASS TRANSPORTATION ADMINISTRATION

Region I, Office of the UMTA Representative, Urban Mass Transportation Administration, Transportation Systems Center, Technology Building, Room 277, 55 Broadway, Boston, Massachusetts 02142 (617) 494–2055

Region II, Office of the UMTA Representative, Urban Mass Transportation Administration, 26 Federal Plaza, Suite 1809, New York, New York 10007 (212) 264–8162

Region III, Office of the UMTA Representative, Urban Mass Transportation Administration, Mall Building, Suite 1214, 32[illegible] Chestnut Street, Philadelphia, Pennsylvania 19106 (215) 597–0407

Region IV, Office of UMTA Representative, Urban Mass Transportation Administration, 1720 Peachtree Road, Northwest, Suite 501, Atlanta, Georgia 0309 (404) 526–3948

Region V, Office of the UMTA Representative, Urban Mass Transportation Administration, 300 South Wacker Drive, Suite 700, Chicago, Illinois 60606 (31 ) 353–6005

Region VI, Office of the UMTA Repreventative, Urban Mass Transportation Administration, Federal Center, Suite 9E24, 1100 Commerce Street, Dallas, Texas 75202 (214) 749–7322

Region VII, Office of the UMTA Representative, Urban Mass Transportation Administration, c/o FAA Management Systems Division, Room 1564D, 601 East 12th Street, Kansas City, Missouri 64106 (816) 374–5567

Region VIII, Office of the UMTA Representative, Urban Mass Transportation Administration, Prudential Plaza, Suite 1822, 1050 17th Street, Denver, Colorado 80202 (303) 837–3242

Region IX, Office of the UMTA Representative, Urban Mass Transportation Administration, 450 Golden Gate Avenue, Box 36125, San Francisco, California 94102 (415) 556–2884

Region X, Office of the UMTA Representative, Urban Mass Transportation Administration, 1321 Second Avenue, Suite 5079, Seattle, Washington (206) 442–0590 mental agencies, which can assist in the preparation of impact statements. Under A-95, review of the proposed project in the case of federally assisted projects (Part I of A-95) generally takes place prior to the preparation of the impact statement. Therefore, comments on the environmental effects of the proposed project that are secured during this stage of the A-95 process represent inputs to the environmental impact statement.

2. In the case of direct Federal development (Part II of A-95), Federal agencies are required to consult with clearinghouses at the earliest practicable time in the planning of the project or activity. Where such consultation occurs prior to completion of the draft impact statement, comments relating to the environmental effects of the proposed action would also represent inputs to the environmental impact statement.

3. In either case, whatever comments are made on environmental effects of proposed Federal or federally assisted projects by clearinghouses, or by State and local environmental agencies through clearinghouses, in the course of the A-95 review should be attached to the draft impact statement when it is circulated for review. Copies of the statement should be sent to the agencies making such comments. Whether those agencies then elect to comment again on the basis of the draft impact statement is a matter to be left to the discretion of the commenting agency depending on its resources, the significance of the project, and the extent to which its earlier comments were considered in preparing the draft statement.

4. The clearinghouses may also be used, by mutual agreement, for securing reviews of the draft environmental impact statement. However, the Federal agency may wish to deal directly with appropriate State or local agencies in the review of impact statements because the clearinghouses may be unwilling or unable to handle this phase of the process. In some cases, the Governor may have designated a specific agency, other than the clearinghouse, for securing reviews of impact statements. In any case, the clearinghouses should be sent copies of the impact statement.

5. To aid clearinghouses in coordinating State and local comments, draft statements should include copies of State and local agency comments made earlier under the A-95 process and should indicate on the summary sheet those other agencies from which comments have been requested, as specified in Appendix I of the CEQ Guidelines.

APPENDIX E

# The President's State of the Union Message on Natural Resources and the Environment, February 15, 1973

*To the Congress of the United States:*

With the opening of a new Congress and the beginning of a new Presidential term come fresh opportunities for achievement in America. To help us consider more adequately the very special challenges of this new year, I am presenting my 1973 State of the Union Message in a number of sections.

Two weeks ago I sent the first of those sections to the Congress—an overview reporting that "the basic state of our Union today is sound, and full of promise."

Today I wish to report to the Congress on the state of our natural resources and environment. It is appropriate that this topic be first of our substantive policy discussions in the State of the Union presentation, since nowhere in our national affairs do we have more gratifying progress—nor more urgent, remaining problems.

There was a time when Americans took our natural resources largely for granted. For example, President Lincoln observed in the State of the Union message for 1862 that "A nation may be said to consist of its territory, its people, and its laws. The territory is the only part which is of certain durability."

In recent years, however, we have come to realize that our "territory"—that is, our land, air, water, minerals, and the like—is not of "certain durability" after all. We have learned that these natural resources are fragile and finite, and that many have been seriously damaged or despoiled.

When we came to office in 1969, we tackled this problem with all the power at our command. Now there is encouraging evidence that the United States has moved away from the environmental crisis that could have been and toward a new era of restoration and renewal. Today, in 1973, I can report to the Congress that we are well on the way to winning the war against environmental degradation—well on the way to making our peace with nature.

## Years of Progress

While I am disappointed that the 92nd Congress failed to act upon 19 of my key natural resources and environment proposals, I am pleased to have signed many of the proposals I supported into law during the past four years. They have included air quality legislation, strengthened water quality and pesticide control legislation, new authorities to control noise and ocean dumping, regulations to prevent oil and other spills in our ports and waterways, and legislation establishing major national recreation areas at America's Atlantic and Pacific gateways, New York and San Francisco.

On the organizational front, the National Environmental Policy Act of 1969 has reformed programs and decision-making processes in our Federal agencies and has given citizens a greater opportunity to contribute as decisions are made. In 1970 I appointed the first Council on Environmental Quality—a group which has provided active leadership in environmental policies. In the same year, I established the Environmental Protection Agency and the National Oceanic and Atmospheric Administration to provide more coordinated and vigorous environmental management. Our natural resource programs still need to be consolidated, however, and I will again submit legislation to the Congress to meet this need.

The results of these efforts are tangible and measurable. Day by day, our air is getting cleaner; in virtually every one of our major cities the levels of air pollution are declining. Month by month, our water pollution problems are also being conquered, our noise and pesticide problems are coming under control, our parklands and protected wilderness areas are increasing.

Year by year, our commitment of public funds for environmental programs continues to grow; it has increased four-fold in the last four years. In the area of water quality alone, it has grown fifteen-fold. In fact, we are now buying new facilities nearly as fast as the construction industry can build them. Spending still more money would not buy us more pollution control facilities but only more expensive ones.

In addition to what Government is doing in the battle against pollution, our private industries are assuming a steadily growing share of responsibility in this field. Last year industrial spending for pollution control jumped by 50 percent, and this year it could reach as much as $5 billion.

All nations, regardless of their economic systems, share to some extent in the environmental problem—but with vigorous United States leadership, joint efforts to solve this global problem are showing results. The United Nations has adopted the American proposal for a special U.N. environmental fund to coordinate and support international environmental programs.

Some 92 nations have concluded an international convention to control the ocean dumping of wastes. An agreement is now being forged in the Intergovernmental Maritime Consultative Organization to end the intentional discharge of oil from ships into the ocean. This objective, first recommended by my Administration, was adopted by the NATO Committee on the Challenges of Modern Society.

Representatives of almost 70 countries are meeting in Washington this week at our initiative to draft a treaty to protect endangered species of plant and animal wildlife. The U.S.-USSR environmental cooperation agreement which I signed in Moscow last year makes two of the world's greatest industrial powers allies against pollution. Another agreement which we concluded last year with Canada will help to clean up the Great Lakes.

Domestically, we can also be proud of the steady progress being made in improving the quality of life in rural and agricultural America. We are beginning to break away from the old, rigid system of controls which eroded the farmer's freedom through Government intrusion in the marketplace. The new flexibility permitted by the Agricultural Act of 1970 has enabled us to help expand farm markets and take advantage of the opportunity to increase exports by almost 60 percent in just three years. Net farm income is at an all-time high, up from $16.1 billion in 1971 to $19 billion in 1972.

## Principles To Guide Us

A record is not something to stand on; it is something to build on. And in this field of natural resources and the environment, we intend to build deligently and well.

As we strive to transform our concern into action, our efforts will be guided by five basic principles:

The first principle is that we must strike a balance so that the protection of our irreplaceable heritage becomes as important as its use. The price of economic growth need not and will not be deterioration in the quality of our lives and our surroundings.

Second, because there are no local or State boundaries to the problems of our environment, the Federal Government must play an active, positive role. We can and will set standards and exercise leadership. We are providing necessary funding support. And we will provide encouragement and incentive for others to help with the job. But Washington must not displace State and local initiatives, and we shall expect the State and local governments—along with the private sector—to play the central role in making the difficult, particular decisions which lie ahead.

Third, the costs of pollution should be more fully met in the free marketplace, not in the Federal budget. For example, the price of pollution control devices for automobiles should be borne by the owner and the user and not by the general taxpayer. The costs of eliminating pollution should be reflected in the costs of goods and services.

Fourth, we must realize that each individual must take the responsibility for looking after his own home and workplace. These daily surroundings are the environment where most Americans spend most of their time. They reflect people's pride in themselves and their consideration for their communities. A person's backyard is not the domain of the Federal Government.

Finally, we must remain confident that America's technological and economic ingenuity will be equal to our environmental challenges. We will not look upon these challenges as insurmountable obstacles.

Instead, we shall convert the so-called crisis of the environment into an opportunity for unprecedented progress.

## Controlling Pollution

We have made great progress in developing the laws and institutions to clean up pollution. We now have formidable new tools to protect against air, water and noise pollution and the special problem of pesticides. But to protect ourselves fully from harmful contaminants, we must still close several gaps in governmental authority.

I was keenly disappointed when the last Congress failed to take action on many of my legislative requests related to our natural resources and environment. In the coming weeks I shall once again send these urgently needed proposals to the Congress so that the unfinished environmental business of the 92nd Congress can become the environmental achievements of the 93rd.

Among these 19 proposals are eight whose passage would give us much greater control over the sources of pollution:

—*Toxic Substances.* Many new chemicals can pose hazards to humans and the environment and are not well regulated. Authority is now needed to provide adequate testing standards for chemical substances and to restrict or prevent their distribution if testing confirms a hazard.

—*Hazardous Wastes.* Land disposal of hazardous wastes has always been widely practiced but is now becoming more prevalent because of strict air and water pollution control programs. The disposal of the extremely hazardous wastes which endanger the health of humans and other organisms is a problem requiring direct Federal regulation. For other hazardous wastes, Federal standards should be established with guidelines for State regulatory programs to carry them out.

—*Safe Drinking Water*. Federal action is also needed to stimulate greater State and local action to ensure high standards for our drinking water. We should establish national drinking water standards, with primary enforcement and monitoring powers retained by the State and local agencies, as well as a Federal requirement that suppliers notify their customers of the quality of their water.

—*Sulfur Oxides Emissions Charge*. We now have national standards to help curtail sulfur emitted into the atmosphere from combustion, refining, smelting and other processes, but sulfur oxides continue to be among our most harmful air pollutants. For that reason, I favor legislation which would allow the Federal Government to impose a special financial charge on those who produce sulfur oxide emissions. This legislation would also help to ensure that low-sulfur fuels are allocated to areas where they are most urgently needed to protect the public health.

—*Sediment Control*. Sediment from soil erosion and runoff continues to be a pervasive pollutant of our waters. Legislation is needed to ensure that the States make the control of sediment from new construction a vital part of their water quality programs.

—*Controlling Environmental Impacts of Transportation*. As we have learned in recent years, we urgently need a mass transportation system not only to relieve urban congestion but also to reduce the concentrations of pollution that are too often the result of our present methods of transportation. Thus I will continue to place high priority upon my request to permit use of the Highway Trust Fund for mass transit purposes and to help State and local governments achieve air quality, conserve energy, and meet other environmental objectives.

—*United Nations Environmental Fund*. Last year the United Nations adopted my proposal to establish a fund to coordinate and support international environmental programs. My 1974 budget includes a request for $10 million as our initial contribution toward the Fund's five-year goal of $100 million, and I recommend authorizing legislation for this purpose.

—*Ocean Dumping Convention*. Along with 91 other nations, the United States recently concluded an international convention calling for regulation of ocean dumping. I am most anxious to obtain the advice and consent of the Senate for this convention as soon as possible. Congressional action is also needed on several other international conventions and amendments to control oil pollution from ships in the oceans.

## Managing The Land

As we readily bring our pollution problems under control, more effective and sensible use of our land is rapidly emerging as among the highest of our priorities. The land is our Nation's basic natural resource, and our stewardship of this resource today will affect generations to come.

America's land once seemed inexhaustible. There was always more of it beyond the horizon. Until the twentieth century we displayed a carelessness about our land, born of our youthful innocence and desire to expand. But our land is no longer an open frontier.

Americans not only need, but also very much want to preserve diverse and beautiful landscapes, to maintain essential farm lands, to save wetlands and wildlife habitats, to keep open recreational space near crowded population centers, and to protect our shorelines and beaches. Our goal is to harmonize

470

development with environmental quality and to add creatively to the beauty and long-term worth of land already being used.

Land use policy is a basic responsibility of State and local governments. They are closer to the problems and closer to the people. Some localities are already reforming land use regulation—a trend I hope will accelerate. But because land is a national heritage, the Federal Government must exercise leadership in land use decision processes, and I am today again proposing that we provide it. In the coming weeks, I will ask the Congress to enact a number of legislative initiatives which will help us achieve this goal:

—*National Land Use Policy.* Our greatest need is for comprehensive new legislation to stimulate State land use controls. We especially need a National Land Use Policy Act authorizing Federal assistance to encourage the States, in cooperation with local governments, to protect lands of critical environmental concern and to regulate the siting of key facilities such as airports, highways and major private developments. Appropriate Federal funds should be withheld from States that fail to act.

—*Powerplant Siting.* An open, long-range planning process is needed to help meet our power needs while also protecting the environment. We can avoid unnecessary delays with a powerplant siting law which assures that electric power facilities are constructed on a timely basis, but with early and thorough review of long-range plans and specific provisions to protect the environment.

—*Protection of Wetlands.* Our coastal wetlands are increasingly threatened by residential and commercial development. To increase their protection, I believe we should use the Federal tax laws to discourage unwise development in wetlands.

—*Historic Preservation and Rehabilitation.* An important part of our national heritage are those historic structures in our urban areas which should be rehabilitated and preserved, not demolished. To help meet this goal, our tax laws should be revised to encourage rehabilitation of older buildings, and we should provide Federal insurance of loans to restore historic buildings for residential purposes.

—*Management of Public Lands.* Approximately one-fifth of the Nation's land is considered "public domain," and lacks the protection of an overall management policy with environmental safeguards. Legislation is required to enable the Secretary of the Interior to protect our environmental interest on those lands.

—*Legacy of Parks.* Under the Legacy of Parks program which I initiated in 1971, 257 separate parcels of parklands and underused Federal lands in all 50 States have been turned over to local control for park and recreational purposes. Most of these parcels are near congested urban areas, so that millions of citizens can now have easy access to parklands. I am pleased to announce today that 16 more parcels of Federal land will soon be made available under this same program.

We must not be content, however, with just the Legacy of Parks program. New authority is needed to revise the formula for allocating grant funds to the States from the Land and Water Conservation Fund. More of these funds should be channelled to States with large urban populations.

—*Mining on Public Lands.* Under a statute now over a century old, public lands must be transferred to private ownership at the request of any person who discovers minerals on them. We thus have no effective control over mining on these properties. Because the public lands belong to all Americans, this 1872 Mining Act should be repealed and replaced with new legislation which I shall send to the Congress.

—*Mined Area Protection.* Surface and underground mining can too often cause serious air and water pollution as well as unnecessary destruction of wildlife habitats and aesthetic and recreational areas. New legislation with stringent performance standards is required to regulate abuses of surface and underground mining in a manner compatible with the environment.

## American Agriculture—A Basic National Resource

Nearly three-fifths of America's land is in the stewardship of the farmer and the rancher. We can be grateful that farmers have been among our best conservationists over the years. Farmers know better than most that sound conservation means better long-term production and improved land values. More importantly, no one respects and understands our soil and land better than those who make their living by the land.

But Americans know their farmers and ranchers best for all they have done to keep us the best-fed and best-clothed people in the history of mankind. A forward-looking agricultural economy is not only essential for environmental progress, but also to provide for our burgeoning food and fiber needs.

My Administration is not going to express its goal for farmers in confusing terms. Our goal, instead, is very simple. The farmer wants, has earned, and deserves more freedom to make his own decisions. The Nation wants and needs expanded supplies of reasonably priced goods and commodities.

These goals are complementary. Both have been advanced by the basic philosophy of the Agricultural Act of 1970. They must be further advanced by Congressional action this year.

The Agricultural Act of 1970 expires with the 1973 crop. We now face the fundamental challenge of developing legislation appropriate to the economy of the 1970's. Over the next several months, the future direction of the farm program must be discussed, debated and written into law. The outcome of this process will be crucial not only to farmers and ranchers, but to consumers and taxpayers as well.

My Administration's fundamental approach to farm policy is to build on the forward course set by the 1970 Act. These principles should guide us in enacting new farm legislation:

—Farmers must be provided with greater freedom to make production and marketing decisions. I have never known anyone in Washington who knows better than a farmer what is in his own best interest.

—Government influence in the farm commodity marketplace must be reduced. Old fashioned Federal intrusion is as inappropriate to today's farm economy as the old McCormick reaper would be on a highly sophisticated modern farm.

—We must allow farmers the opportunity to produce for expanding domestic demands and to continue our vigorous competition in export markets. We will not accomplish that goal by telling the farmer how much he can grow or the rancher how much livestock he can raise. Fidelity to this principle will have the welcome effect of encouraging both fair food prices for consumers and growing income from the marketplace for farmers.

—We must reduce the farmer's dependence on Government payments through increased returns from sales of farm products at home and abroad. Because some of our current methods of handling farm problems are outmoded, the farmer has been unfairly saddled with the unflattering image of drinking primarily at the Federal well. Let us remember that more than 93 percent of gross farm income comes directly through the marketplace. Farmers and ranchers are strong and independent businessmen; we should expand their opportunity to exercise their strength and independence.

—Finally, we need a program that will put the United States in a good posture for forthcoming trade negotiations.

In pursuing all of these goals, we will work closely through the Secretary of Agriculture with the Senate Committee on Agriculture and Forestry and the House Committee on Agriculture to formulate and enact new legislation in areas where it is needed.

I believe, for example, that dairy support systems, wheat, feed grains and cotton allotments and bases—some established decades ago—are drastically outdated. They tend to be discriminatory for many farm operators.

It would be desirable to establish, after a reasonable transition period, a more equitable basis for production adjustment in the agricultural economy should such adjustment be needed in the years ahead. Direct Federal payments should, at the end of the transition period, be limited to the amounts necessary to compensate farmers for withholding unneeded land from crop production.

As new farm legislation is debated in the months ahead, I hope the Congress will address this important subject with a deep appreciation of the need to keep the Government off the farm as well as keeping the farmer on.

## Protecting Our Natural Heritage

An important measure of our true commitment to environmental quality is our dedication to protecting the wilderness and its inhabitants. We must recognize their ecological significance and preserve them as sources of inspiration and education. And we need them as places of quiet refuge and reflection.

Important progress has been made in recent years, but still further action is needed in the Congress. Specifically, I will ask the 93rd Congress to direct its attention to the following areas of concern:

—*Endangered Species.* The limited scope of existing laws requires new authority to identify and protect endangered species before they are so depleted that it is too late. New legislation must also make the taking of an endangered animal a Federal offense.

—*Predator Control.* The widespread use of highly toxic poisons to kill coyotes and other predatory animals has spread persistent poisons to range and forest lands without adequate foresight of environmental effects. I believe Federal assistance is now required so that we can find better means of controlling predators without endangering other wildlife.

—*Wilderness Areas.* Historically, Americans have always looked westward to enjoy wilderness areas. Today we realize that we must also preserve the remaining areas of wilderness in the East, if the majority of our people are to have the full benefit of our natural glories. Therefore I will ask the Congress to amend the legislation that established the Wilderness Preservation System so that more of our Eastern lands can be included.

—*Wild and Scenic Rivers.* New legislation is also needed to continue our expansion of the national system of wild and scenic rivers. Funding authorization must be increased by $20 million to complete acquisitions in seven areas, and we must extend the moratorium on Federal licensing for water resource project on those rivers being considered for inclusion in the system.

—*Big Cypress National Fresh Water Preserve.* It is our great hope that we can create a reserve of Florida's Big Cypress Swamp in order to protect the outstanding wildlife in that area, preserve the water supply of Everglades National Park and provide the Nation with an outstanding recreation area. Prompt passage of Federal legislation would allow the Interior Department to forestall private or commercial development and inflationary pressures that will build if we delay.

—*Protecting Marine Fisheries.* Current regulation of fisheries off U.S. coasts is inadequate to conserve and manage these resources. Legislation is needed to authorize U.S. regulation of foreign fishing off U.S. coasts to the fullest extent authorized by international agreements. In addition, domestic fishing should be regulated in the U.S. fisheries zone and in the high seas beyond that zone.

—*World Heritage Trust.* The United States has endorsed an international convention for a World Heritage Trust embodying our proposals to accord special recognition and protection to areas of the world which are of such unique natural, historical, or cultural value that they are a part of the heritage of all mankind. I am hopeful that this convention will be ratified early in 1973.

*Weather Modification.* Our capacity to affect the weather has grown considerably in sophistication and predictability, but with this advancement has also come a new potential for endangering lives and property and causing adverse environmental effects. With additional Federal regulations, I believe that we can minimize these dangers.

## Meeting Our Energy Needs

One of the highest priorities of my Administration during the coming year will be a concern for energy supplies—a concern underscored this winter by occasional fuel shortages. We must face up to a stark fact in America: we are now consuming more energy than we produce.

A year and a half ago I sent to the Congress the first Presidential message ever devoted to the energy question. I shall soon submit a new and far more comprehensive energy message containing wide-ranging initiatives to ensure necessary supplies of energy at acceptable economic and environmental costs. In the meantime, to help meet immediate needs, I have temporarily suspended import quotas on home heating oil east of the Rocky Mountains.

As we work to expand our supplies of energy, we should also recognize that we must balance those efforts with our concern to preserve our environment. In the past, as we have sought new energy sources, we have too often damaged or despoiled our land. Actions to avoid such damage will probably aggravate our energy problems to some extent and may lead to higher prices. But all development and use of energy sources carries environmental risks, and we must find ways to minimize those risks while also providing adequate supplies of energy. I am fully confident that we can satisfy both of these imperatives.

## Going Forward in Confidence

The environmental awakening of recent years has triggered substantial progress in the fight to preserve and renew the great legacies of nature. Unfortunately, it has also triggered a certain tendency to despair. Some people have moved from complacency to the opposite extreme of alarmism, suggesting that our pollution problems were hopeless and predicting impending ecological disaster. Some have suggested that we could never reconcile environmental protection with continued economic growth.

I reject this doomsday mentality—and I hope the Congress will also reject it. I believe that we can meet our environmental challenges without turning our back on progress. What we must do is to stop the hand-wringing, roll up our sleeves and get on with the job.

The advocates of defeatism warn us of all that is wrong. But I believe they underestimate this Nation's genius for responsive adaptability and its enormous reservoir of spirit.

I believe there is always a sensible middle ground between the Cassandras and the Pollyannas. We must take our stand upon that ground.

I have profound respect for the enormous challenge ahead, but I have even stronger respect for the capacity and character of the American people. Many of us have heard the adage that the last letters of the word "American," say "I can." I am confident that we can, and we will, meet our natural resource challenges.

RICHARD NIXON

The White House,
February 15, 1973.

APPENDIX F

# The President's Energy Message
## April 18, 1973

*To the Congress of the United States:*

At home and abroad, America is in a time of transition. Old problems are yielding to new initiatives, but in their place new problems are arising which once again challenge our ingenuity and require vigorous action. Nowhere is this more clearly true than in the field of energy.

As America has become more prosperous and more heavily industrialized, our demands for energy have soared. Today, with 6 percent of the world's population, we consume almost a third of all the energy used in the world. Our energy demands have grown so rapidly that they now outstrip our available supplies, and at our present rate of growth, our energy needs a dozen years from now will be nearly double what they were in 1970.

In the years immediately ahead, we must face up to the possibility of occasional energy shortages and some increase in energy prices.

Clearly, we are facing a vitally important energy challenge. If present trends continue unchecked, we could face a genuine energy crisis. But that crisis can and should be averted, for we have the capacity and the resources to meet our energy needs if only we take the proper steps—and take them now.

More than half the world's total reserves of coal are located within the United States. This resource alone would be enough to provide for our energy needs for well over a century. We have potential resources of billion of barrels of recoverable oil, similar quantities of shale oil and more than 2,000 trillion cubic feet of natural gas. Properly managed, and with more attention on the part of consumers to the conservation of energy, these supplies can last for as long as our economy depends on conventional fuels.

In addition to natural fuels, we can draw upon hydroelectric plants and increasing numbers of nuclear powered facilities. Moreover, long before our present energy sources are exhausted, America's vast capabilities in research and development can provide us with new, clean and virtually unlimited sources of power.

Thus we should not be misled into pessimistic predictions of an energy disaster. But neither should we be lulled into a false sense of security. We must examine our circumstances realistically, carefully weigh the alternatives—and then move forward decisively.

## Weighing the Alternatives

Over 90 percent of the energy we consume today in the United States comes from three sources: natural gas, coal and petroleum. Each source presents us with a different set of problems.

Natural gas is our cleanest fuel and is most preferred in order to protect our environment, but ill-considered regulations of natural gas prices by the Federal Government have produced a serious and increasing scarcity of this fuel.

We have vast quantities of coal, but the extraction and use of coal have presented such persistent environmental problems that, today, less than 20 percent of our energy needs are met by coal and the health of the entire coal industry is seriously threatened.

Our third conventional resource is oil, but domestic production of available oil is no longer able to keep pace with demands.

In determining how we should expand and develop these resources, along with others such as nuclear power, we must take into account not only our economic goals, but also our environmental goals and our national security goals. Each of these areas is profoundly affected by our decisions concerning energy.

If we are to maintain the vigor of our economy, the health of our environment, and the security of our energy resources, it is essential that we strike the right balance among these priorities.

The choices are difficult, but we cannot refuse to act because of this. We cannot stand still simply because it is difficult to go forward. That is the one choice Americans must never make.

The energy challenge is one of the great opportunities of our time. We have already begun to meet that challenge, and realize its opportunities.

## National Energy Policy

In 1971, I sent to the Congress the first message on energy policies ever submitted by an American President. In that message I proposed a number of specific steps to meet our projected needs by increasing our supply of clean energy in America.

Those steps included expanded research and development to obtain more clean energy, increased availability of energy resources located on Federal lands, increased efforts in the development of nuclear power, and a new Federal organization to plan and manage our energy programs.

In the twenty-two months since I submitted that message, America's energy research and development efforts have been expanded by 50 percent.

In order to increase domestic production of conventional fuels, sales of oil and gas leases on the Outer Continental Shelf have been increased. Federal and State standards to protect the marine environment in which these leases are located are being tightened. We have developed a more rigorous surveillance capability and an improved ability to prevent and clean up oil spills.

We are planning to proceed with the development of oil shale and geothermal energy sources on Federal lands, so long as an evaluation now underway shows that our environment can be adequately protected.

We have also taken new steps to expand our uranium enrichment capacity for the production of fuels for nuclear power plants, to standardize nuclear power plant designs, and to ensure the continuation of an already enviable safety record.

We have issued new standards and guidelines, and have taken other actions to increase and encourage better conservation of energy.

In short, we have made a strong beginning in our effort to ensure that America will always have the power needed to fuel its prosperity. But what we have accomplished is only a beginning.

Now we must build on our increased knowledge, and on the accomplishments of the past twenty-two months, to develop a more comprehensive, integrated national energy policy. To carry out this policy we must:

- —increase domestic production of all forms of energy;
- —act to conserve energy more effectively;
- —strive to meet our energy needs at the lowest cost consistent with the protection of both our national security and our natural environment;
- —reduce excessive regulatory and administrative impediments which have delayed or prevented construction of energy-producing facilities;
- —act in concert with other nations to conduct research in the energy field and to find ways to prevent serious shortages; and
- —apply our vast scientific and technological capacities—both public and private—so we can utilize our current energy resources more wisely and develop new sources and new forms of energy.

The actions I am announcing today and the proposals I am submitting to the Congress are designed to achieve these objectives. They reflect the fact that we are in a period of transition in which we must work to avoid or at least minimize short-terms supply shortages, while we act to expand and develop our domestic supplies in order to meet long-term energy needs.

We should not suppose this transition period will be easy. The task ahead will require the concerted and cooperative efforts of consumers, industry, and government.

## Developing Our Domestic Energy Resources

The effort to increase domestic energy production in a manner consistent with our economic, environmental and security interests should focus on the following areas:

### Natural Gas

Natural gas is America's premium fuel. It is clean-burning and thus has the least detrimental effect on our environment.

Since 1966, our consumption of natural gas has increased by over one-third, so that today natural gas comprises 32 percent of the total energy we consume from all sources. During this same period, our proven and available reserves of natural gas have decreased by a fifth. Unless we act responsibly, we will soon encounter increasing shortages of this vital fuel.

Yet the problem of shortages results less from inadequate resources than from ill-conceived regulation. Natural gas is the fuel most heavily regulated by the Federal Government—through the Federal Power Commission. Not only are the operations of interstate natural gas pipelines regulated, as was originally and properly intended by the Congress, but the price of the natural gas supplied to these pipelines by thousands of independent producers has also been regulated.

For more than a decade the prices of natural gas supplied to pipelines under this extended regulation have been kept artificially low. As a result, demand has been artificially stimulated, but the exploration and development required to provide new supplies to satisfy this increasing demand have been allowed to wither. This form of government regulation has contributed heavily to the shortages we have experienced, and to the greater scarcity we now anticipate.

As a result of its low regulated price, more than 50 percent of our natural gas is consumed by industrial users and utilities, many of which might otherwise be using coal or oil. While homeowners are being forced to turn away from natural gas and toward more expensive fuels, unnecessarily large quantities of natural gas are being used by industry.

Furthermore, because prices within producing States are often higher than the interstate prices established by the Federal Power Commission, most newly discovered and newly produced natural gas does not enter interstate pipelines. Potential consumers in non-producing States thus suffer the worst shortages. While the Federal Power Commission has tried to alleviate these problems, the regulatory framework and attendant judicial constraints inhibit the ability of the Commission to respond adequately.

It is clear that the price paid to producers for natural gas in interstate trade must increase if there is to be the needed incentive for increasing supply and reducing inefficient usage. Some have suggested additional regulation to provide new incentives, but we have already seen the pitfalls in this approach. We must regulate less, not more. At the same time, we cannot remove all natural gas regulations without greatly inflating the price of gas currently in production and generating windfall profits.

To resolve this issue, I am proposing that gas from new wells, gas newly-dedicated to interstate markets, and the continuing production of natural gas from expired contracts should no longer be subject to price regulation at the wellhead. Enactment of this legislation should stimulate new exploration and development. At the same time, because increased prices on new unregulated gas would be averaged in with the prices for gas that is still regulated, the consumer should be protected against precipitous cost increases.

To add further consumer protection against unjustified price increases, I propose that the Secretary of the Interior be given authority to impose a ceiling on the price of new natural gas when circumstances warrant. Before exercising this power, the Secretary would consider the cost of alternative domestic fuels, taking into account the superiority of natural gas from an environmental standpoint. He would also consider the importance of encouraging production and more efficient use of natural gas.

## Outer Continental Shelf

Approximately half of the oil and gas resources in this country are located on public lands, primarily on the Outer Continental Shelf (OCS). The speed at which we can increase our domestic energy production will depend in large measure on how rapidly these resources can be developed.

Since 1954, the Department of the Interior has leased to private developers almost 8 million acres on the Outer Continental Shelf. But this is only a small percentage of these potentially productive areas. At a time when we are being forced to obtain almost 30 percent of our oil from foreign sources, this level of development is not adequate.

I am therefore directing the Secretary of the Interior to take steps which would triple the annual acreage leased on the Outer Continental Shelf by 1979, beginning with expanded sales in 1974 in the Gulf of Mexico and including areas beyond 200 meters in depth under conditions consistent with my oceans policy statement of May, 1970. By 1985, this accelerated leasing rate could increase annual energy production by an estimated 1.5 billion barrels of oil (approximately 16 percent of our projected oil requirements in that year), and 5 trillion cubic feet of natural gas (approximately 20 percent of expected demand for natural gas that year).

In the past, a central concern in bringing these particular resources into production has been the threat of environmental damage. Today, new techniques, new regulations and standards, and new surveillance capabilities enable us to reduce and control environmental dangers substantially. We should now take advantage of this progress. The resources under the Shelf, and on all our public lands, belong to all Americans, and the critical needs of all Americans for new energy supplies require that we develop them.

If at any time it is determined that exploration and development of a specific shelf area can only proceed with inadequate protection of the environment, we will not commence or continue operations. This policy was reflected in the suspension of 35 leases in the Santa Barbara Channel in 1971. We are continuing the Santa Barbara suspensions and I again request that the Congress pass legislation that would provide for appropriate settlement for those who are forced to relinquish their leases in the area.

At the same time, I am directing the Secretary of the Interior to proceed with leasing the Outer Continental Shelf beyond the Channel Islands of California if the reviews now underway show that the environmental risks are acceptable.

I am also asking the Chairman of the Council on Environmental Quality to work with the Environmental Protection Agency, in consultation with the National Academy of Sciences and appropriate Federal agencies, to study the environmental impact of oil and gas production on the Atlantic Outer Continental Shelf and in the Gulf of Alaska. No drilling will be undertaken in these areas until its environmental impact is determined. Governors, legislators and citizens of these areas will be consulted in this process.

Finally, I am asking the Secretary of the Interior to develop a long-term leasing program for *all* energy resources on public lands, based on a thorough analysis of the Nation's energy, environmental, and economic objectives.

## Alaskan Pipeline

Another important source of domestic oil exists on the North Slope of Alaska. Although private industry stands ready to develop these reserves and the Federal Government has spent large sums on environmental analyses, this project is still being delayed. This delay is not related to any adverse judicial findings concerning environmental impact, but rather to an outmoded legal restriction regarding the width of the right of way for the proposed pipeline.

At a time when we are importing growing quantities of oil at great detriment to our balance of payments, and at a time when we are also experiencing significant oil shortages, we clearly need the two million barrels a day which the North Slope could provide—a supply equal to fully one-third of our present import levels.

In recent weeks I have proposed legislation to the Congress which would remove the present restriction on the pipeline. I appeal to the Congress to act swiftly on this matter so that we can begin construction of the pipeline with all possible speed.

I oppose any further delay in order to restudy the advisability of building the pipeline through Canada. Our interest in rapidly increasing our supply of oil is best served by an Alaskan pipeline. It could be completed much more quickly than a Canadian pipeline; its entire capacity would be used to carry domestically owned oil to American markets where it is needed; and construction of an Alaskan pipeline would create a significant number of American jobs both in Alaska and in the maritime industry.

## Shale Oil

Recoverable deposits of shale oil in the continental United States are estimated at some 600 billion barrels, 80 billion of which are considered easily accessible.

At the time of my Energy Message of 1971, I requested the Secretary of the Interior to develop an oil shale leasing program on a pilot basis and to provide me with a thorough evaluation of the environmental impact of such a program. The Secretary has prepared this pilot project and expects to have a final environmental impact statement soon. If the environmental risks are acceptable, we will proceed with the program.

To date there has been no commercial production of shale oil in the United States. Our pilot program will provide us with valuable experience in using various operational techniques and acting under various environmental conditions. Under the proposed program, the costs both of development and environmental protection would be borne by the private lessee.

## Geothermal Leases

At the time of my earlier Energy Message, I also directed the Department of the Interior to prepare a leasing program for the development of geothermal energy on Federal lands. The regulations and final environmental analysis for such a program should be completed by late spring of this year.

If the analysis indicates that we can proceed in an environmentally acceptable manner, I expect leasing of geothermal fields on Federal lands to begin soon thereafter.

The use of geothermal energy could be of significant importance to many of our western areas, and by supplying a part of the western energy demand, could release other energy resources that would otherwise have to be used. Today, for instance, power from the Geysers geothermal field in California furnishes about one-third of the electric power of the city of San Francisco.

New technologies in locating and producing geothermal energy are now under development. During the coming fiscal year, the National Science Foundation and the Geological Survey will intensify their research and development efforts in this field.

## Coal

Coal is our most abundant and least costly domestic source of energy. Nevertheless, at a time when energy shortages loom on the horizon, coal provides less than 20 percent of our energy demands, and there is serious danger that its use will be reduced even further. If this reduction occurs, we would have to increase our oil imports rapidly, with all the trade and security problems this would entail.

Production of coal has been limited not only by competition from natural gas—a competition which has been artificially induced by Federal price regulation—but also by emerging environmental concerns and mine health and safety requirements. In order to meet environmental standards, utilities have shifted to natural gas and imported low-sulphur fuel oil. The problem is compounded by the fact that some low-sulphur coal resources are not being developed because of uncertainty about Federal and State mining regulations.

I urge that highest national priority be given to expanded development and utilization of our coal resources. Present and potential users who are able to choose among energy sources should consider the national interest as they make their choice. Each decision against coal increases petroleum or gas consumption, compromising our national self-sufficiency and raising the cost of meeting our energy needs.

In my State of the Union Message on Natural Resources and the Environment earlier this year, I called for strong legislation to protect the environment from abuse caused by mining. I now repeat that call. Until the coal industry knows the mining rules under which it will have to operate, our vast reserves of low-sulphur coal will not be developed as rapidly as they should be and the under-utilization of such coal will persist.

The Clean Air Act of 1970, as amended, requires that primary air quality standards—those related to health—must be met by 1975, while more stringent secondary standards—those related to the "general welfare"—must be met within a reasonable period. The States are moving very effectively to meet primary standards established by the Clean Air Act, and I am encouraged by their efforts.

At the same time, our concern for the "general welfare" or national interest should take into account considerations of national security and economic prosperity, as well as our environment.

If we insisted upon meeting both primary and secondary clean air standards by 1975, we could prevent the use of up to 155 million tons of coal per year. This would force an increase in demand for oil of 1.6 million barrels per day. This oil would have to be imported, with an adverse effect on our balance of payments of some $1.5 billion or more a year. Such a development would also threaten the loss of an estimated 26,000 coal mining jobs.

If, on the other hand, we carry out the provisions of the Clean Air Act in a judicious manner, carefully meeting the primary, health-related standards, but not moving in a precipitous way toward meeting the secondary standards, then we should be able to use virtually all of that coal which would otherwise go unused.

The Environmental Protection Agency has indicated that the reasonable time allowed by the Clean Air Act for meeting secondary standards could extend beyond 1975. Last year, the Administrator of the Environmental Protection Agency sent to all State governors a letter explaining that during the current period of shortages in low-sulphur fuel the States should not require the burning of such fuels except where necessary to meet the primary standards for the protection of health. This action by the States should permit the desirable substitution of coal for low-sulphur fuel in many instances. I strongly support this policy.

Many State regulatory commissions permit their State utilities to pass on increased fuel costs to the consumer in the form of higher rates, but there are sometimes lags in allowing the costs of environmental control equipment to be passed on in a similar way. Such lags discourage the use of environmental control technology and encourage the use of low-sulphur fuels, most of which are imported.

To increase the incentive for using new environmental technology, I urge all State utility commissions to ensure that utilities receive a rapid and fair return on pollution control equipment, including stack gas cleaning devices and coal gasification processes.

As an additional measure to increase the production and use of coal, I am directing that a new reporting system on national coal production be instituted within the Department of the Initerior, and I am asking the Federal Power Commission for regular reports on the use of coal by utilities.

I am also stepping up our spending for research and development in coal, with special emphasis on technology for sulphur removal and the development of low-cost, clean-burning forms of coal.

### Nuclear Energy

Although our greatest dependence for energy until now has been on fossil fuels such as coal and oil, we must not and we need not continue this heavy reliance in the future. The major alternative to fossil fuel energy for the remainder of this century is nuclear energy.

Our well-established nuclear technology already represents an indispensable source of energy for meeting present needs. At present there are 30 nuclear power plants in operation in the United States; of the new electrical generator capacity contracted for during 1972, 70 percent will be nuclear powered. By 1980, the amount of electricity generated by nuclear reactors will be equivalent to 1.25 billion barrels of oil, or 8 trillion cubic feet of gas. It is estimated that nuclear power will provide more than one-quarter of this country's electrical production by 1985, and over half by the year 2000.

Most nuclear power plants now in operation utilize light water reactors. In the near future, some will use high temperature gas-cooled reactors. These techniques will be supplemented during the next decade by the fast breeder reactor, which will bring about a 30-fold increase in the efficiency with which we utilize our domestic uranium resources. At present, development of the liquid metal fast breeder reactor is our highest priority target for nuclear research and development.

Nuclear power generation has an extraordinary safety record. There has never been a nuclear-related fatality in our civilian atomic energy program. We intend to maintain that record by increasing research and development in reactor safety.

The process of determining the safety and environmental acceptability of nuclear power plants is more vigorous and more open to public participation than for any comparable industrial enterprise. Every effort must be made by the Government and industry to protect public health and safety and to provide satisfactory answers to those with honest concerns about this source of power.

At the same time, we must seek to avoid unreasonable delays in developing nuclear power. They serve only to impose unnecessary costs and aggravate our energy shortages. It is discouraging to know that nuclear facilities capable of generating 27,000 megawatts of electric power which were expected to be operational by 1972 were not completed. To replace that generating capacity we would have to use the equivalent of one-third of the natural gas the country used for generating electricity in 1972. This situation must not continue.

In my first Energy Special Message in 1971, I proposed that utilities prepare and publish long-range plans for the siting of nuclear power plants and transmission lines. This legislation would provide a Federal-State framework for licensing individual plants on the basis of a full and balanced consideration of both environmental and energy needs. The Congress has not acted on that proposal. I am resubmitting that legislation this year with a number of new provisions to simplify licensing, including one to require that the Government act on all completed license applications within 18 months after they are received.

I would also emphasize that the private sector's role in future nuclear development must continue to grow. The Atomic Energy Commission is presently taking steps to provide greater amounts of enriched uranium fuel for the Nation's nuclear power plants. However, this expansion will not fully meet our needs in the 1980's; the Government now looks to private industry to provide the additional capacity that will be required.

Our nuclear technology is a national asset of inestimable value. It is essential that we press forward with its development.

The increasing occurrence of unnecessary delays in the development of energy facilities must be ended if we are to meet our energy needs. To be sure, reasonable safeguards must be vigorously maintained for protection of the public and of our environment. Full public participation and questioning must also be allowed as we decide where new energy facilities are to be built. We need to streamline our governmental procedures for licensing and inspections, reduce overlapping jurisdictions and eliminate confusion generated by the government.

To achieve these ends I am taking several steps. During the coming year we will examine various possibilities to assure that all public and private interests are impartially and expeditiously weighed in all government proceedings for permits, licensing and inspections.

I am again proposing siting legislation to the Congress for electric facilities and for the first time, for deepwater ports. All of my new siting legislation includes provision for simplified licensing at both Federal and State levels. It is vital that the Congress take prompt and favorable action on these proposals.

### Encouraging Domestic Exploration

Our tax system now provides needed incentives for mineral exploration in the form of percentage depletion allowances and deductions for certain drilling expenses. These provisions do not, however, distinguish between exploration for new reserves and development of existing reserves.

In order to encourage increased exploration, I ask the Congress to extend the investment credit provisions of our present tax law so that a credit will be provided for all exploratory drilling for new oil and gas fields. Under this proposal, a somewhat higher credit would apply for successful exploratory wells than for unsuccessful ones, in order to put an additional premium on results.

The investment credit has proven itself a powerful stimulus to industrial activity. I expect it to be equally effective in the search for new reserves.

## Importing to Meet Our Energy Needs

### Oil Imports

In order to avert a short-term fuel shortage and to keep fuel costs as low as possible, it will be necessary for us to increase fuel imports. At the same time, in order to reduce our long-term reliance on imports, we must encourage the exploration and development of our domestic oil and the construction of refineries to process it.

The present quota system for oil imports—the Mandatory Oil Import Program—was established at a time when we could produce more oil at home than we were using. By imposing quantitative restrictions on imports, the quota system restricted imports of foreign oil. It also encouraged the development of our domestic petroleum industry in the interest of national security.

Today, however, we are not producing as much oil as we are using, and we must import ever larger amounts to meet our needs.

As a result, the current Mandatory Oil Import Program is of virtually no benefit any longer. Instead, it has the very real potential of aggravating our supply problems, and it denies us the flexibility we need to deal quickly and efficiently with our import requirements. General dissatisfaction with the program and the apparent need for change has led to uncertainty. Under these conditions, there can be little long-range investment planning for new drilling and refinery construction.

Effective today, I am removing by proclamation all existing tariffs on imported crude oil and products. Holders of import licenses will be able to import petroleum duty free. This action will help hold down the cost of energy to the American consumer.

Effective today, I am also suspending direct control over the quantity of crude oil and refined products which can be imported. In place of these controls, I am substituting a license-fee quota system.

Under the new system, present holders of import licenses may import petroleum exempt from fees up to the level of their 1973 quota allocations. For imports in excess of the 1973 level, a fee must be paid by the importer.

This system should achieve several objectives.

First, it should help to meet our immediate energy needs by encouraging importation of foreign oil at the lowest cost to consumers, while also providing incentives for exploration and development of our domestic resources to meet our long-term needs. There will be little paid in fees this year, although all exemptions from fees will be phased out over several years. By gradually increasing fees over the next two and one-half years to a maximum level of one-half cent per gallon for crude oil and one and one-half cents per gallon for all refined products, we should continue to meet our energy needs while encouraging industry to increase its domestic production.

Second, this system should encourage refinery construction in the United States, because the fees are higher for refined products than for crude oil. As an added incentive, crude oil in amounts up to three-fourths of new refining capacity may be imported without being subject to any fees. This special allowance will be available to an oil company during the first five years after it builds or expands its refining capacity.

Third, this system should provide the flexibility we must have to meet short and long-term needs efficiently. We will review the fee level periodically to ensure that we are imposing the lowest fees consistent with our intention to increase domestic production while keeping costs to the consumer at the lowest possible level. We will also make full use of the Oil Import Appeals Board to ensure that the needs of all elements of the petroleum industry are met, particularly those of the independent operators who help to maintain market competition.

Fourth, the new system should contribute to our national security. Increased domestic production will leave us less dependent on foreign supplies. At the same time, we will adjust the fees in a manner designed to encourage, to the extent possible, the security of our foreign supplies. Finally, I am directing the Oil Policy Committee to examine incentives aimed at increasing our domestic storage capacity or shut-in production. In this way we will provide buffer stocks to insulate ourselves against a temporary loss of foreign supplies.

### Deepwater Ports

It is clear that in the foreseeable future, we will have to import oil in large quantities. We should do this as cheaply as we can with minimal damage to the environment. Unfortunately, our present capabilities are inadequate for these purposes.

The answer to this problem lies in deepwater ports which can accommodate those larger ships, providing important economic advantages while reducing the risks of collision and grounding. Recent studies by the Council on Environmental Quality demonstrate that we can expect considerably less pollution if we use fewer but larger tankers and deepwater facilities, as opposed to the many small tankers and conventional facilities which we would otherwise need.

If we do not enlarge our deepwater port capacity it is clear that both American and foreign companies will expand oil transshipment terminals in the Bahamas and the Canadian Maritime Provinces. From these terminals, oil will be brought to our conventional ports by growing numbers of small and medium size transshipment vessels, thereby increasing the risks of pollution from shipping operations and accidents. At the same time, the United States will lose the jobs and capital that those foreign facilities provide.

Given these considerations, I believe we must move forward with an ambitious program to create new deepwater ports for receiving petroleum imports.

The development of ports has usually been a responsibility of State and local governments and the private sector. However, States cannot issue licenses beyond the three-mile limit. I am therefore proposing legislation to permit the Department of the Interior to issue such licenses. Licensing would be contingent upon full and proper evaluation of environmental impact, and would provide for strict navigation and safety, as well as proper land use requirements. The proposed legislation specifically provides for Federal cooperation with State and local authorities.

## Conserving Energy

The abundance of America's natural resources has been one of our greatest advantages in the past. But if this abundance encourages us to take our resources for granted, then it may well be a detriment to our future.

Common sense clearly dictates that as we expand the types and sources of energy available to us for the future, we must direct equal attention to conserving the energy available to us today, and we must explore means to limit future growth in energy demand.

We as a nation must develop a national energy conservation ethic. Industry can help by designing products which conserve energy and by using energy more efficiently. All workers and consumers can help by continually saving energy in their day-to-day activities: by turning out lights, tuning up automobiles, reducing the use of air conditioning and heating, and purchasing products which use energy efficiently.

Government at all levels also has an important role to play, both by conserving energy directly, and by providing leadership in energy conservation efforts.

I am directing today that an Office of Energy Conservation be established in the Department of the Interior to coordinate the energy conservation programs which are presently scattered throughout the Federal establishment. This office will conduct research and work with consumer and environmental groups in their efforts to educate consumers on ways to get the greatest return on their energy dollar.

To provide consumers with further information, I am directing the Department of Commerce, working with the Council on Environmental Quality and the Environmental Protection Agency, to develop a voluntary system of energy efficiency labels for major home appliances. These labels should provide data on energy use as well as a rating comparing the product's efficiency to other similar products. In addition, the Environmental Protection Agency will soon release the results of its tests of fuel efficiency in automobiles.

There are other ways, too, in which government can exercise leadership in this field. I urge again, for example, that we allow local officials to use money from Highway Trust Fund for mass transit purposes. Greater reliance on mass transit can do a great deal to help us conserve gasoline.

The Federal Government can also lead by example. The General Services Administration, for instance, is constructing a new Federal office building using advanced energy conservation techniques, with a goal of reducing energy use by 20 percent over typical buildings of the same size. At the same time, the National Bureau of Standards is evaluating energy use in a full-size house within its laboratories. When this evaluation is complete, analytical techniques will be available to help predict energy use for new dwellings. This information, together with the experience gained in the construction and operation of the demonstration Federal building, will assist architects and contractors to design and construct energy-efficient buildings.

Significant steps to upgrade insulation standards on single and multi-family dwellings were taken at my direction in 1971 and 1972, helping to reduce heat loss and otherwise conserve energy in the residential sector. As soon as the results of these important demonstration projects are available, I will direct the Federal Housing Administration to update its insulation standards in light of what we have learned and to consider their possible extension to mobile homes.

Finally, we should recognize that the single most effective means of encouraging energy conservation is to ensure that energy prices reflect their true costs. By eliminating regulations such as the current ceiling on natural gas prices and by ensuring that the costs of adequate environmental controls are equitably allocated, we can move toward more efficient distribution of our resources.

Energy conservation is a national necessity, but I believe that it can be undertaken most effectively on a voluntary basis. If the challenge is ignored, the result will be a danger of increased shortages, increased prices, damage to the environment and the increased possibility that conservation will have to be undertaken by compulsory means in the future. There should be no need for a nation which has always been rich in energy to have to turn to energy rationing. This is a part of the energy challenge which every American can help to meet, and I call upon every American to do his or her part.

## Research and Development

If we are to be certain that the forward thrust of our economy will not be hampered by insufficient energy supplies or by energy supplies that are prohibitively expensive, then we must not continue to be dependent on conventional forms of energy. We must instead make every useful effort through research and development to provide both alternative sources of energy and new technologies for producing and utilizing this energy.

For the short-term future, our research and development strategy will provide technologies to extract and utilize our existing fossil fuels in a manner most compatible with a healthy environment.

In the longer run, from 1985 to the beginning of the next century, we will have more sophisticated development of our fossil fuel resources and on the full development of the Liquid Metal Fast Breeder Reactor. Our efforts for the distant future center on the development of technologies—such as nuclear fusion and solar power—that can provide us with a virtually limitless supply of clean energy.

In my 1971 Energy Special Message to the Congress I outlined a broadly based research and development program. I proposed the expansion of cooperative Government-industry efforts to develop the Liquid Metal Fast Breeder Reactor, coal gasification, and stack gas cleaning systems at the demonstration level. These programs are all progressing well.

My budget for fiscal year 1974 provides for an increase in energy research and development funding of 20 percent over the level of 1973.

My 1974 budget provides for creation of a new central energy fund in the Interior Department to provide additional money for non-nuclear research and development, with the greatest part designated for coal research. This central fund is designed to give us the flexibility we need for rapid exploitation of new, especially promising energy technologies with near-term payoffs.

One of the most promising programs that will be receiving increased funding in fiscal year 1974 is the solvent refined coal process which will produce low-ash, low-sulphur fuels from coal. Altogether, coal research and development and proposed funding is increased by 27 percent.

In addition to increased funding for the Liquid Metal Fast Breeder Reactor, I am asking for greater research and development on reactor safety and radioactive waste disposal, and the production of nuclear fuel.

The waters of the world contain potential fuel—in the form of a special isotope of hydrogen—sufficient to power fusion reactors for thousands of years. Scientists at the Atomic Energy Commission now predict with increasing confidence that we can demonstrate laboratory feasibility of controlled thermonuclear fusion by magnetic confinement in the near future. We have also advanced to the point where some scientists believe the feasibility of laser fusion could be demonstrated within the next several years. I have proposed in my 1974 budget a 35 percent increase in funding for our total fusion research and development effort to accelerate experimental programs and to initiate preliminary reactor design studies.

While we look to breeder reactors to meet our mid-term energy needs, today's commercial power reactors will continue to provide most of our nuclear generating capacity for the balance of this century. Although nuclear reactors have had a remarkable safety record, my 1974 budget provides additional funds to assure that our rapidly growing reliance on nuclear power will not compromise public health and safety. This includes work on systems for safe storage of the radioactive waste which nuclear reactors produce. The Atomic Energy Commission is working on additional improvements in surface storage and will continue to explore the possibility of underground burial for long-term containment of these wastes.

Solar energy holds great promise as a potentially limitless source of clean energy. My new budget triples our solar energy research and development effort to a level of $12 million. A major portion of these funds would be devoted to accelerating the development of commercial systems for heating and cooling buildings.

Research and development funds relating to environmental control technologies would be increased 24 percent in my 1974 budget. This research includes a variety of projects related to stack gas cleaning and includes the construction of a demonstration sulphur dioxide removal plant. In addition, the Atomic Energy Commission and the Environmental Protection Agency will continue to conduct research on the thermal effects of power plants.

While the Federal Government is significantly increasing its commitment to energy research and development, a large share of such research is and should be conducted by the private sector.

I am especially pleased that the electric utilities have recognized the importance of research in meeting the rapidly escalating demand for electrical energy. The recent establishment of the Electric Power Research Institute, which will have a budget in 1974 in excess of $100 million, can help develop technology to meet both load demands and environmental regulations currently challenging the industry.

Historically the electric power industry has allocated a smaller portion of its revenues to research than have most other technology-dependent industries. This pattern has been partly attributable to the reluctance of some State utility commissions to include increased research and development expenditures in utility rate bases. Recently the Federal Power Commission instituted a national rule to allow the recovery of research and development expenditures in rates. State regulatory agencies have followed the FPC's lead and are liberalizing their treatment of research and development expenditures consistent with our changing national energy demands.

I am hopeful that this trend will continue and I urge all State utility commissions to review their regulations regarding research and development expenditures to ensure that the electric utility industry can fully cooperate in a national energy research and development effort.

It is foolish and self-defeating to allocate funds more rapidly than they can be effectively spent. At the same time, we must carefully monitor our progress and our needs to ensure that our funding is adequate. When additional funds are found to be essential, I shall do everything I can to see that they are provided.

## International Cooperation

The energy challenge confronts every nation. Where there is such a community of interest, there is both a cause and a basis for cooperative action.

Today, the United States is involved in a number of cooperative, international efforts. We have joined with the other 22 member-nations of the Organization for Economic Cooperation and Development to produce a comprehensive report on long-term problems and to develop an agreement for sharing oil in times of acute shortages. The European Economic Community has already discussed the need for cooperative efforts and is preparing recommendations for a Community energy policy. We have expressed a desire to work together with them in this effort.

We have also agreed with the Soviet Union to pursue joint research in magnethydrodynamics (MHD), a highly efficient process for generating electricity, and to exchange information on fusion, fission, the generation of electricity, transmission and pollution control technology. These efforts should be a model for joint research efforts with other countries. Additionally, American companies are looking into the possibility of joint projects with the Soviet Union to develop natural resources for the benefit of both nations.

I have also instructed the Department of State, in coordination with the Atomic Energy Commission, other appropriate Government agencies, and the Congress to move rapidly in developing a program of international cooperation in research and development on new forms of energy and in developing international mechanisms for dealing with energy questions in times of critical shortages.

I believe the energy challenge provides an important opportunity for nations to pursue vital objectives through peaceful cooperation. No chance should be lost to strengthen the structure of peace we are seeking to build in the world, and few issues provide us with as good an opportunity to demonstrate that there is more to be gained in pursuing our national interests through mutual cooperation than through destructive competition or dangerous confrontation.

## Federal Energy Organization

If we are to meet the energy challenge, the current fragmented organization of energy-related activities in the executive branch of the Government must be overhauled.

In 1971, I proposed legislation to consolidate Federal energy-related activities within a new Department of Natural Resources. The 92nd Congress did not act on this proposal. In the interim I have created a new post of Counsellor to the President on Natural Resources to assist in the policy coordination in the natural resources field.

Today I am taking executive action specifically to improve the Federal organization of energy activities.

I have directed the Secretary of the Interior to strengthen his Department's organization of energy activities in several ways.

—The responsibilities of the new Assistant Secretary for Energy and Minerals will be expanded to incorporate all departmental energy activities;

—The Department is to develop a capacity for gathering and analysis of energy data;

—An Office of Energy Conservation is being created to seek means for reducing demands for energy;

—The Department of the Interior has also strengthened its capabilities for overseeing and coordinating a broader range of energy research and development.

By Executive order, I have placed authority in the Department of the Treasury for directing the Oil Policy Committee. That Committee coordinates the oil import program and makes recommendations to me for changes in that program. The Deputy Secretary of the Treasury has been designated Chairman of that Committee.

Through a second Executive order, effective today, I am strengthening the capabilities of the Executive Office of the President to deal with top level energy policy matters by establishing a special energy committee composed of three of my principal advisors. The order also reaffirms the appointment of a Special Consultant, who heads an energy staff in the Office of the President.

Additionally, a new division of Energy and Science is being established within the Office of Management and Budget.

While these executive actions will help, more fundamental reorganization is needed. To meet this need, I shall propose legislation to establish a Department of Energy and Natural Resources (DENR) building on the legislation I submitted in 1971, with heightened emphasis on energy programs.

This new Department would provide leadership across the entire range of national energy. It would, in short, be responsible for administering the national energy policy detailed in this message.

## Conclusion

Nations succeed only as they are able to respond to challenge, and to change when circumstances and opportunities require change.

When the first settlers came to America, they found a land of untold natural wealth, and this became the cornerstone of the most prosperous nation in the world. As we have grown in population, in prosperity, in industrial capacity, in all those indices that reflect the constant upward thrust in the American standard of living, the demands on our natural resources have also grown.

Today, the energy resources which have fueled so much of our national growth are not sufficiently developed to meet the constantly increasing demands which have been placed upon them. The time has come to change the way we meet these demands. The challenge facing us represents one of the great opportunities of our time—an opportunity to create an even stronger domestic economy, a cleaner environment, and a better life for all our people.

The proposals I am submitting and the actions I will take can give us the tools to do this important job.

The need for action is urgent. I hope the Congress will act with dispatch on the proposals I am submitting. But in the final analysis, the ultimate responsibility does not rest merely with the Congress or with this Administration. It rests with all of us—with government, with industry and with the individual citizen.

Whenever we have been confronted with great national challenges in the past, the American people have done their duty. I am confident we shall do so now.

RICHARD NIXON

The White House,
April 18, 1973.

APPENDIX G

# Federal Environmental Program Budgets*

This analysis identifies Federal funding for environmental activities in three selected categories:

- Pollution control and abatement activities;
- Activities to protect and enhance the environment; and
- Activities to understand, describe and predict environmental conditions.

## Pollution Control and Abatement

The Federal Government's programs to control and abate pollution are directed toward continuing a strong effort to decrease environmental degradation while holding down inflation and recognizing resource requirements for other programs.

**[In millions of dollars]**

| | 1970 actual | 1971 actual | 1972 actual | 1973 estimate | 1974 estimate |
|---|---|---|---|---|---|
| Budget authority | 1,432 | 1,823 | 3,196 | 8,334 | 1,559 |
| Outlays | 751 | 1,149 | 1,314 | 1,917 | 3,111 |

Budget authority for the 1973 and 1974 period is nearly 7 times that appropriated in 1970. Outlays for these programs in 1974 will increase by $1,194 million over the 1973 level. Of the total outlays, $727 million in 1973 and $1.6 billion in 1974 will be for grants for the construction of waste treatment plants. Funds allotted to the States for waste treatment facilities construction will total $2 billion for 1973 and $3 billion for 1974. The budget author-

---

*Office of Management and Budget, *Special Analyses: Budget of the U.S. Government, Fiscal Year 1974* (Washington: Government Printing Office, 1973), pp. 2[illegible]0–83.

ity for both of these years is shown in 1973 as provided by law. Grants from the allotted funds will cover 75% of the costs of constructing municipal sewage treatment facilities. Appropriations and allotments since the beginning of 1972 total $8.9 billion, nearly three times the amount appropriated in the preceding 15 years. This amount, added to unexpended prior-year funds, makes a total of $10.1 billion available in 1973 and 1974 for construction of waste treatment facilities.

Grants are also made to State and local governments for pollution control as indicated in table Q–1. Outlays for these grants will increase by 108% over 1973, from $835 million to $1,735 million.

**Table Q–1.**

### Pollution Control and Abatement Activities

**[In millions of dollars]**

| Type of activity | Budget authority | | | Outlays | | |
|---|---|---|---|---|---|---|
| | 1972 actual | 1973 estimate | 1974 estimate | 1972 actual | 1973 estimate | 1974 estimate |
| Financial aid to State and local governments | 2,112 | 7,056 | [1] 192 | 490 | 835 | 1,735 |
| Research and development | 487 | 591 | 614 | 403 | 502 | 590 |
| Federal abatement and control operations | 172 | 229 | 270 | 164 | 207 | 266 |
| Manpower development | 14 | 14 | 12 | 10 | 15 | 15 |
| Reduce pollution from Federal facilities | 252 | 310 | 315 | 152 | 232 | 345 |
| Other pollution control and abatement activities | 159 | 134 | 156 | 95 | 126 | 160 |
| **Total** | **3,196** | **8,334** | **1,559** | **1,314** | **1,917** | **3,111** |

[1] Contract authority for the Environmental Protection Agency in 1974 was made available in 1973 as provided by law.

Included in these grants are funds made available to State, regional, and local agencies to help support air pollution control programs. Outlays of $51 million in 1974 will provide financial assistance for implementing the national primary and secondary ambient air quality standards. Assistance will be provided in the development of air quality monitoring systems, emissions inventories, plans for effective enforcement of standards, land use and transportation control regulations, and emergency episode plans. Technical assistance is also provided through program grants to assist State, interstate and other pollution control agencies in developing their technical capabilities.

For research and development activities, outlays will increase by 18% from $502 million in 1973 to $590 million in 1974. These activities include efforts oriented toward determining the sources and effects of pollution and to develop and test pollution control technologies. Current policy calls for: less emphasis on development of new control technologies leaving more of this to the private sector, permitting the continued refinement and application of presently available technologies, the study of human health effects, ecological effects, and the economic costs and benefits of alternative standards and regulatory approaches. This shift in emphasis will permit more effective identification and evaluation of potentially new environmental problems.

Water quality research will emphasize development of criteria for protection of marine and fresh water fish and other aquatic life, achievement of better understanding of the eutrophication process, and development of lake restoration procedures. The Great Lakes research program, initiated in 1973 to identify and assess pollution problems in the Great Lakes, will receive continued support.

Air quality research and development efforts will concentrate on effects through initiation of field investigation of regional air pollution models and processes and continue epidemiological and toxicological studies of the effects of pollutants on man and animals. Ongoing demonstrations of stack gas treatment technology will be completed and efforts will be directed to long-term technologies relative to clean fuel development.

Outlays for Federal abatement and control operations will increase by 28% from $207 million in 1973 to $266 million in 1974. This includes funds for planning, monitoring and surveillance, standard setting and enforcement, and technical assistance. Funding for manpower development activities will continue to decline somewhat, reflecting the steady growth in the number of people interested in and available for positions in environmental activities.

Federal agencies are involved in a range of activities to control pollution from their facilities. Among them are construction or modification of waste treatment plants, fuel conversion and stack gas cleaning for air pollution control and cooperative projects with States and communities for solid or liquid waste disposal. Outlays for these activities will increase by 49% in 1974, from $232 million in 1973 to $345 million in 1974, primarily in the Department of Defense for pollution originating from ships.

### Agencies Involved

Major Federal activities to control and abate pollution are conducted in the Environmental Protection Agency. A number of other agencies also carry on important pollution control activities, as indicated in table Q–2.

**Table Q–2.**

### Pollution Control and Abatement Activities—by Agency

**[In millions of dollars]**

| Agency | Budget authority | | | Outlays | | |
|---|---|---|---|---|---|---|
| | 1972 actual | 1973 estimate | 1974 estimate | 1972 actual | 1973 estimate | 1974 estimate |
| Environmental Protection Agency | 2,448 | 7,421 | [1] 590 | 763 | 1,147 | 2,127 |
| Defense—Military | 208 | 306 | 347 | 134 | 197 | 282 |
| Atomic Energy Commission | 144 | 166 | 198 | 138 | 162 | 191 |
| Transportation | 86 | 107 | 114 | 40 | 73 | 90 |
| Agriculture | 100 | 103 | 80 | 77 | 110 | 120 |
| Defense—Civil | 9 | 14 | 10 | 8 | 16 | 11 |
| Interior | 112 | 107 | 120 | 73 | 103 | 116 |
| Commerce | 18 | 14 | 4 | 12 | 16 | 19 |
| National Aeronautics and Space Administration | 27 | 58 | 61 | 16 | 36 | 46 |
| National Science Foundation | 15 | 15 | 17 | 15 | 15 | 17 |
| Other agencies | 29 | 23 | 18 | 38 | 42 | 92 |
| **Total** | **3,196** | **8,334** | **1,559** | **1,314** | **1,917** | **3,111** |

[1] Contract authority for the Environmental Protection Agency in 1974 was made available in 1973 as provided by law.

Outlays for EPA will increase by 85%, from $1,147 million in 1973 to $2,127 million in 1974. The greatest single category of Federal spending for pollution control and abatement is for constructing or improving waste treat ment plants. EPA provides funds to localities for the construction of modern treatment plants, including experimental pilot plants that might demonstrate a more efficient way of treating municipal sewage. In the past year, a number of these experimental projects showed promise. Among them:

- A full-scale demonstration of the removal of phosphates from water by the addition of minerals with minimum modification of the installation.
- The technical and economic practicality of utilizing waste "pickle liquor" to remove phosphorus from raw sewage has been developed in some six different projects.
- A plant study which demonstrates how secondary treatment plant effluent can be disinfected with ultra-violet light.

Research and development accounts for $125 million of EPA's 1974 budget. Outlays of $53 million will be allocated for studying the processes and effects of pollutants. Processes and effects research will include the health effects of pollutants, the ecological and other nonhealth effects of pollutants, the movement and transformation of pollutants, the measurements, measurement methods and instruments used in assessing pollution problems. Outlays of $72 million will be allocated in 1974 to provide the technology necessary to abate and control air and water pollution.

Progress has been made in the implementation of the Clean Air Act Amendments of 1970, enforcement of other environmental laws and the passage of a wide range of environmental legislation. The Federal program to enhance air quality moved forward as EPA and the States began to implement their numerous regulatory responsibilities under the comprehensive Clean Air Act Amendments of 1970. EPA promulgated a series of proposed and final regulations spelling out requirements of the Clean Air Act. The broadest effort centered on the submission, review, and approval of State plans to implement National Ambient Air Quality Standards. The plans of all 50 States or other jurisdictions have been given partial or final approval. A shift in resources will occur within EPA from review of State implementation plans to execution of the implementation plans and enforcement. Funding will increase in 1974 directed largely to enforcement of emission standards for new sources and hazardous pollutants and for monitoring of State enforcement programs. Funding is also increased to implement new environmental legislation. The Federal Environmental Pesticide Control Act of 1972 will provide stronger EPA regulatory authority in the areas of registration, labeling and use of pesticides considerably strengthens enforcement authority. The Noise Control Act of 1972 empowers EPA to set standards limiting the noise generating characteristics of construction and transportation equipment and other equipment powered by internal combustion engines. The standards would cover such major sources of noise as automobiles, trucks, motorcycles, compressors, and off-road vehicles. The Marine Protection Research and Sanctuaries Act of 1972 authorizes EPA to ban unregulated dumping and to strictly limit disposal of any materials harmful to the marine environment. The 1972 amendments to the Federal Water Pollution Control Act greatly increase aid to States and localities for building waste treatment facilities and sets new goals for cleanup of rivers, lakes and other waters.

Other agencies also carry out important pollution control and abatement activities. For example, the *Department of Defense* will continue to expand its R. & D. programs to reduce pollution from its industrial production facilities, military bases, naval vessels, aircraft, and jet engine test facilities.

The *Atomic Energy Commission* will continue its program of research, development, and monitoring to provide information required to assure that nuclear operations are conducted according to procedures which minimize or eliminate potential effects on man and his environment. Increased emphasis in 1974 will be placed on thermal alteration of public waters and the effects of such additives or contaminants as chlorine, trace metals, and biocides in reactor effluents. The regulatory program will increase significantly in 1974, primarily to meet the increased workload created by additional applications projected from the growing number of proposed new powerplants.

The *Department of Agriculture* conducts research on agriculturally related pollution such as pesticides, animal and crop processing wastes, fertilizer and plant nutrients. Progress has been made in reducing pollution from facilities in National forests by a minimization of stream pollution and sediment, and prevention of logging residue deposition in stream channels.

The *Department of the Interior* will continue research relating to pollution sources and effects, will expand activities to reduce pollution from facilities in the national parks, and will increase research under pilot plant programs to develop methods of converting coal to fuel gas with less pollution. In addition, a new energy research and development fund of $25 million is to be established in the Department of the Interior to provide support for technological opportunities that may arise in the area of low pollution nonnuclear energy production and utilization.

The *Corps of Engineers* will continue projects planned with the purpose of gathering information to permit a more accurate assessment of the effects of offshore construction, offshore dredging, navigation channel dredging, and fundamental knowledge of coastal vegetation and its use to achieve engineering and ecological goals.

The *Department of Transportation* will continue funding for work on reducing aircraft engine noise, studying environmental effects of aircraft, and reducing pollution from Coast Guard facilities.

The *Department of Commerce* conducts environmental monitoring and prediction activities related to air and water pollution through the National Oceanic and Atmospheric Administration. The National Bureau of Standards is engaging in research and development for reference standards and measurement systems in air, water, noise, electromagnetic, and radiation pollution. The Maritime Administration's pollution abatement program is directed toward achieving pollution-free ship operations.

The *National Aeronautics and Space Administration* conducts a continuing research and development program to improve the technology of aircraft noise reduction. Techniques for reducing pollutant emissions will include studies in primary combustors and reheat burners. Principal attention during 1974 will be given to reducing emissions of nitric oxide at high power settings and carbon monoxide and hydrocarbons at engine idle. Techniques, procedures, and prototype equipment are being developed and tested to provide the capability of atmospheric purification, water purification, and solid waste management for use in advanced spacecraft.

## Media Polluted and Pollutants

Pollution control and abatement activities are generally focused on reducing a variety of pollutants in air or water or particular classes of pollutants such as pesticides or radiation. Table Q–3 summarizes the total Federal effort in terms of media polluted and also identifies funding associated with selected pollutants. Among the media, water pollution currently receives the greatest share—81%—of total Federal pollution control obligations. This large share is a result of grants and loans for construction of municipal waste treatment facilities.

Air pollution efforts account for 10% of the total. Federal efforts in 1974 include research and development, grants to State and local air pollution control agencies, and direct Federal operations such as monitoring, standard setting, and enforcement. Increased emphasis will be given in 1974 to improving knowledge of the health related effects of various concentrations of pollutants, and quantifying the health benefits that would result from their control. Activities relating to pollution of land are for research and other studies concerned with effects of acid mine drainage, nutrients, pesticides, and other substances.

Federal pollution control activities relating to radiation, pesticides, solid wastes, and noise are directed toward research relating to effects, control technology, and standard setting and enforcement.

**Table Q-3.**

## Pollution Control and Abatement Activities—by Media or Pollutant

**[In millions of dollars]**

| Media or pollutant | Obligations | | |
|---|---|---|---|
| | 1972 actual | 1973 estimate | 1974 estimate |
| Media polluted: | | | |
| Water: | | | |
| Construction grants and loans | 839 | 3,875 | 3,400 |
| Other | 328 | 469 | 576 |
| Air | 373 | 535 | 504 |
| Land | 55 | 57 | 54 |
| Other (e.g., living things materials) | 200 | 314 | 246 |
| Multimedia (i.e., more than one of above) | 73 | 86 | 106 |
| **Total** | **1,868** | **5,336** | **4,886** |
| Selected pollutants:[1] | | | |
| Solid wastes | 91 | 116 | 106 |
| Pesticides | 40 | 45 | 52 |
| Radiation | 141 | 174 | 193 |
| Noise | 77 | 103 | 90 |

[1] Funds for selected pollutants are included in the "media" breakdown above.

Excluded from funding shown above for pollution control and abatement activities are activities that are carried on for some other primary purpose but which also contribute to the reduction of pollution. For example, extensive activities to hold soil in place to preserve soil productivity, such as those financed by the Department of Agriculture, and erosion control activities by Corps of Engineers and Department of Transportation (highways), have been excluded from this analysis even though these activities also serve to reduce sediment pollution of water.

## Selected Environmental Protection and Enhancement Activities

Federal funding will increase for environmental protection and enhancement activities such as providing recreational areas, parks, historic sites, and fish and wildlife preservation.

**[In millions of dollars]**

| | 1972 actual | 1973 estimate | 1974 estimate |
|---|---|---|---|
| Budget authority | 1,068 | 1,039 | 701 |
| Outlays | 718 | 878 | 940 |

### Protection and Enhancement Activities

The Federal Government provides grants to State and local governments for acquiring land for recreational purposes, for preserving open space and historic properties, and for fish and wildlife refuges. Aid is also provided for research and planning, construction and maintenance of recreational facilities and wildlife refuges. Outlays for aid to State and local governments will increase by 21% from $262 million in 1973 to $318 million in 1974.

The Federal Government also performs directly such activities as acquiring lands for the preservation of unique natural areas and for recreation, supporting sport fisheries and wildlife preservation activities, preserving historic properties, and conducting related functions.

Environmental protection and enhancement activities include:

- City recreation, which covers all federally assisted or direct Federal projects or activities (including historic preservation) which are located within incorporated places of 25,000 or more population.
- Unique natural areas and endangered species, which covers all national parks, monuments, scenic rivers, trails, wilderness, seashores and refuges for endangered species, and similar non-Federal areas.

**Table Q-4.**

## Selected Environmental Protection and Enhancement Activities

**[In millions of dollars]**

| | Budget authority | | | Outlays | | |
|---|---|---|---|---|---|---|
| | 1972 actual | 1973 estimate | 1974 estimate | 1972 actual | 1973 estimate | 1974 estimate |
| Financial aid to State and local governments: | | | | | | |
| Purchase, development, and operations: | | | | | | |
| City recreation | 119 | 103 | 11 | 52 | 62 | 78 |
| Preserve unique natural areas and protect endangered species | 31 | 30 | 0 | 21 | 20 | 24 |
| Noncity general recreation | 206 | 149 | 43 | 78 | 106 | 133 |
| Sport fish and wildlife | 57 | 64 | 65 | 56 | 62 | 62 |
| Historic preservation and rehabilitation | 12 | 13 | 16 | 7 | 10 | 18 |
| All other State and local aid | 2 | 3 | 3 | 1 | 2 | 3 |
| Subtotal | 427 | 362 | 138 | 215 | 262 | 318 |
| Direct Federal activities: | | | | | | |
| Purchase, development, and operations: | | | | | | |
| City recreation | 51 | 51 | 60 | 42 | 45 | 59 |
| Preserve unique natural areas and protect endangered species | 163 | 173 | 125 | 114 | 130 | 127 |
| Noncity general recreation | 150 | 199 | 176 | 127 | 192 | 188 |
| Sport fish and wildlife | 110 | 107 | 106 | 99 | 114 | 114 |
| Historic preservation and rehabilitation | 53 | 70 | 61 | 36 | 57 | 60 |
| All other direct Federal activity | 114 | 77 | 35 | 85 | 78 | 74 |
| Subtotal | 641 | 677 | 567 | 509 | 614 | 627 |
| **Total** | **1,068** | **1,039** | **701** | **718** | **878** | **940** |

- Noncity general recreation, which covers all national recreation areas, recreation programs in national forests, separable recreation costs for Federal water projects, and federally assisted State and local areas located outside incorporated places of 25,000 or more population.
- Sport fish and wildlife, which covers all national wildlife refuges, national fish hatcheries and federally assisted projects serving similar purposes including rare and endangered species.
- Historic preservation and rehabilitation, which covers all national historic sites, military parks, battlefields, and similar areas and federally assisted historic preservation and rehabilitation.
- All other activities, which include all Federal aid and direct Federal costs for general administration, planning, studies, and similar activities not otherwise allocated.

## Agencies Involved

The *Department of the Interior* accounts for approximately 75% of the outlays for the environmental protection and enhancement activities described in this section.

The Bureau of Outdoor Recreation promotes coordination of Federal outdoor recreation programs, and administers the land and water conservation fund which provides grants for planning, acquisition, and development of State and local recreation areas and Federal purchases of nationally important lands. The 1974 budget for the land and water conservation fund provides $178 million of obligations for grants to State and local governments to help them meet the increasing demand for local recreation areas, especially those located in or near major cities.

The Bureau of Sport Fisheries and Wildlife provides assistance to State and local governments for fish and wildlife restoration, management, and research. The Bureau administers 95 hatcheries, which help to support inland fisheries resources, and 342 units in the National Wildlife Refuge System which includes about 31 million acres, of which nearly 20 million acres are in Alaska. Endangered species, including nine mammals, 15 birds, and the alligator, are protected on 82 of the national wildlife refuges. The Bureau manages 271 wildlife refuges with 4.2 million acres for migratory waterfowl and 51 other areas with 4 million acres for other migratory birds.

The National Park Service administers 299 areas comprising about 29 million acres located in 47 States, the District of Columbia, Puerto Rico, and the Virgin Islands. These include national parks, monuments, historic sites, and national recreation areas which have been established to preserve the Nation's natural and historic heritage. In 1974 the Park Service will continue planning and design work and commence construction of visitor facilities in the Nation's Capital and elsewhere for the American Revolution Bicentennial. The Park Service also encourages the preservation of additional historic properties throughout the Nation by assisting the States and territories to conduct statewide historic preservation surveys and by making matching grants for individual preservation projects.

The Bureau of Land Management protects and manages over 450 million acres—mainly in the Western States and Alaska. This land area represents 60% of all federally owned lands and 20% of America's total land base. Legislation proposed by this Administration would establish a national policy that these national resource lands be managed under principles of multiple use and sustained yield in such a way as to protect the quality of the environment. The Bureau of Reclamation provides recreation facilities on some of the reservoir projects which it constructs.

The *Department of Agriculture* carries out a variety of environmental enhancement activities, particularly through the Forest Service. The 187 million acres of National Forest System lands are managed in accordance with the provisions of The Multiple Use-Sustained Yield Act to provide outdoor recreation, range, timber, watershed, and wildlife values in combinations that will best meet the needs of the Nation without impairing the productivity of the land. A review of all existing primitive areas for possible designation as wilderness is underway. Other activities include research to develop more attractive and durable plants, shrubs, flowers, and trees to improve natural beauty.

The *Corps of Engineers* provides facilities for water-based recreation at reservoirs and other public works. As of January 1971, these facilities included 3,284 recreation areas providing 2,666 designated day-use areas, 1,391 designated camping areas with over 50,000 campsites.

### Donations, Bargain Sales and Transfers of Federal Property

Assistance to State and local governments for parks, recreation, and historic preservation also is provided in the form of donations of Federal surplus properties and the sale at $2.50 per acre of public domain lands. In 1974, an estimated 34,000 acres of Federal property will be made available either by donation or by transfer to other Federal agencies and 15,000 acres of public domain lands will be sold at $2.50 per acre for these purposes.

**Table Q-5.**

### Selected Environmental Protection and Enhancement Activities—by Agency

**[In millions of dollars]**

| Agency | Budget authority | | | Outlays | | |
|---|---|---|---|---|---|---|
| | 1972 actual | 1973 estimate | 1974 estimate | 1972 actual | 1973 estimate | 1974 estimate |
| Interior | 821 | 778 | 544 | 525 | 649 | 707 |
| Agriculture | 71 | 78 | 74 | 71 | 78 | 79 |
| Housing and Urban Development | 100 | 100 | 0 | 52 | 57 | 70 |
| Defense—Civil | 50 | 76 | 73 | 46 | 86 | 76 |
| State | 2 | 2 | 2 | 2 | 2 | 2 |
| Tennessee Valley Authority | 4 | 3 | 6 | 4 | 4 | 5 |
| Other agencies | 20 | 2 | 2 | 18 | 2 | 1 |
| **Total** | **1,068** | **1,039** | **701** | **718** | **878** | **940** |

## Understanding, Describing, and Predicting the Environment [1]

Federal agencies conduct a wide variety of activities to understand, describe, and predict environmental conditions. Objectives range from the provision of routine weather forecasts to the scientific understanding of complex ecological systems.

**[In millions of dollars]**

| | 1972 actual | 1973 estimate | 1974 estimate |
|---|---|---|---|
| Budget authority | 887 | 924 | 903 |
| Outlays | 839 | 854 | 842 |

---

[1] This section excludes activities reported under pollution control and abatement.

**Activities**

Over half of the funding for this category supports environmental observation and measurement to describe and predict weather and ocean conditions and to develop methods of prediction and control of earthquakes. Table Q–6 indicates that outlays will amount to $409 million in 1974 for research, development, and operational activities in this category. Funding will also be provided for:

- Survey activities to describe the physical environment for the purpose of preparing maps and charts; and
- Weather modification.

**Table Q–6.**

### Understanding, Describing, and Predicting the Environment

**[In millions of dollars]**

| Type of activity | Budget authority | | | Outlays | | |
|---|---|---|---|---|---|---|
| | 1972 actual | 1973 estimate | 1974 estimate | 1971 actual | 1972 estimate | 1974 estimate |
| Observe and predict weather and ocean conditions, disturbances: | | | | | | |
| Research and development | 146 | 170 | 167 | 139 | 153 | 160 |
| Operations | 256 | 262 | 271 | 241 | 244 | 249 |
| Locating and describing natural resources: | | | | | | |
| Research and development | 163 | 143 | 127 | 157 | 133 | 120 |
| Operations | 63 | 72 | 70 | 65 | 71 | 70 |
| Physical environmental surveys: | | | | | | |
| Research and development | 10 | 15 | 11 | 8 | 13 | 11 |
| Operations | 96 | 104 | 107 | 92 | 99 | 101 |
| Weather modification | 18 | 16 | 23 | 16 | 16 | 19 |
| Research on environmental impact on man | 54 | 57 | 38 | 47 | 52 | 36 |
| Ecological and other basic environmental research | 81 | 85 | 89 | 74 | 73 | 76 |
| **Total** | **887** | **924** | **903** | **839** | **854** | **842** |

Continued emphasis will be placed upon research to develop a better understanding of the impact of the environment on man, and on ecological and other basic environmental research, for which outlays will be $76 million in 1974.

**Agencies Involved**

In this category as shown in table Q–7, the Department of Commerce currently accounts for about 25% of all Federal activities. NOAA carries on a wide range of environmental observation and prediction activities, weather modification experiments, mapping, and charting, data dissemination services, and related research. Outlays will increase from $194 million in 1973 to $207 million in 1974. Particular emphasis will be given to improving weather monitoring, prediction and warning to help further reduce the loss of life and property from natural disasters. Increases in 1974 will allow continued improvement in weather prediction and warnings, initiation of planning for a major hurricane modification research effort in the Pacific, expansion of research on marine ecosystems analysis to help determine the effects of ocean dumping and increased research to protect marine mammals. An increase is also provided for the weather satellite program for continuation of the polar orbiting satellite system as well as implementation of a two geostationary satellite system.

The *Department of Defense* conducts activities in environmental observation and measurement to describe and predict weather and ocean conditions and disturbances important to military operations. Research is conducted in oceanographic instrumentation development and operational systems for observing and forecasting the ocean environment. Research and development is also conducted in weather modification by nuclear and nucleation processes, cloud physics, numerical modeling of warm fog and cumulous cloud situations, and fog dispersal field experiments.

The *National Science Foundation* supports research activities related to improving the quality of the environment, such as the regional environmental systems and weather modification, programs of research applied to national needs (RANN), the international decade of ocean exploration (IDOE), and other environmentally related research programs. Outlays will increase from $99 million in 1973 to $107 million in 1974. Particular emphasis will be given to land use planning and management research in 1974 in identifying and analyzing the problems of regional environmental systems such as the Chesapeake Bay, Delaware Basin, and the Gallatin Canyon in the Rockies. Research support will continue for programs designed to develop the degree of scientific understanding of weather phenomena needed to modify weather for man's benefit. Increased emphasis will be placed upon the inadvertent modification of weather by human activities. The influence of weather extremes upon electrical and gas utility demands will be examined to see if such actions as the production of artificially produced cloud cover in the summer or cloud dissipation in the winter can have an impact upon peak energy requirements. Research support will continue for programs to measure and assess the effects of trace contaminants in the environment.

The *Department of the Interior* carries out such activities as geologic investigations, topographic mapping, weather modification, and water resources research. Funds provided in 1974 will support further research on the prediction and control of earthquakes, further appraisal of the potential mineral resources of the Outer Continental Shelves, and continued work on application of remote sensing data from aircraft and spacecraft to earth resource measurement, management and analysis.

The *National Aeronautics and Space Administration* conducts activities concerned with the application of satellite technology to atmospheric sciences and measurement of earth resources. Ongoing projects include an all weather atmospheric sounding experiments satellite (NIMBUS–E. & F.) to improve atmospheric temperature sounding and wind measurements; synchronous cloud imaging satellite (Synchronous Meteorological Satellites, SMS–A. & B.), operational temperature sounding satellite (TIROS–N), a next generation operational prototype extending capability for temperature sounding, and the sounding rocket program to make direct measurements of upper atmospheric parameters. NASA supports the NOAA operational program and conducts an operational satellite improvement program to incorporate research developments into the operational satellite system. In 1974, development of an oceanographic and air pollution observing satellite (NIMBUS–G) will be initiated. The objective of NIMBUS–G is to demonstrate the feasibility of remote sensing systems to detect certain gaseous constituents as well as collect oceanographic data which can be used in weather prediction models.

The *Department of Agriculture* conducts research on such activities as remote sensing of soil properties and uses, salinity, and plant stress effects. A variety of activities are conducted to develop better materials and methods necessary for the establishment of replacement vegetation and proper land management. Several types of environmental analysis and monitoring systems have been established in national forest and in State and private forest programs. Extensive climatological monitoring and forecasting is carried out in connection with fire control programs. Emphasis will continue on basic ecological research.

**Table Q–7.**

## Understanding, Describing, and Predicting the Environment—by Agency

**[In millions of dollars]**

| Agency | Budget authority | | | Outlays | | |
|---|---|---|---|---|---|---|
| | 1972 actual | 1973 estimate | 1974 estimate | 1972 actual | 1973 estimate | 1974 estimate |
| Commerce | 212 | 218 | 235 | 188 | 194 | 207 |
| Defense—Military | 160 | 168 | 172 | 156 | 161 | 163 |
| National Science Foundation | 118 | 118 | 133 | 106 | 99 | 107 |
| Interior | 134 | 156 | 149 | 131 | 149 | 144 |
| National Aeronautics and Space Administration | 150 | 142 | 111 | 144 | 129 | 119 |
| Agriculture | 56 | 60 | 58 | 59 | 61 | 58 |
| Health, Education, and Welfare | 26 | 26 | 5 | 24 | 26 | 6 |
| Transportation | 14 | 13 | 13 | 14 | 13 | 13 |
| Smithsonian Institution | 8 | 9 | 10 | 8 | 8 | 9 |
| Other agencies | 9 | 14 | 17 | 9 | 14 | 16 |
| **Total** | **887** | **924** | **903** | **839** | **854** | **842** |

The *Department of Health, Education, and Welfare* conducts a variety of activities relating to environmental impact of man, principally research at the Department's National Institutes of Health.

The *Department of Transportation* conducts oceanographic and meteorological research and surveys largely through the Coast Guard.

The *Smithsonian Institution* conducts a variety of programs dealing with environmental impact on man and is developing environmental baseline data on the abundance of plants and animals in relation to modification of the environment by man. Biological and physical data are being assembled and analyzed on specific important ecosystems to predict the consequences of environmental change.

## Environmental Research and Development Activities

Sections of this analysis include funding for environmental research and development activities for convenience of reference. Funding for R. & D. included in the three sections is summarized in table Q–8.

**Table Q–8.**

## Environmental Research and Development Activities

**[In millions of dollars]**

| Category | Budget authority | | | Outlays | | |
|---|---|---|---|---|---|---|
| | 1972 actual | 1973 estimate | 1974 estimate | 1972 actual | 1973 estimate | 1974 estimate |
| Pollution control and abatement | 487 | 591 | 614 | 403 | 502 | 590 |
| Understanding, describing, and predicting | 472 | 486 | 455 | 441 | 440 | 422 |
| **Total** | **959** | **1,077** | **1,069** | **844** | **942** | **1,012** |

## Other Environmental Activities

The meaning of the term 'environment' is still subject to widely varying definitions. This special analysis of Federal funding for environmental activities has been limited to selected areas. Among the areas of federally funded activity important to environmental understanding and environmental quality not included in this analysis are:

- Environmental education;
- Preventing or correcting environmental degradation resulting from public works or natural resources exploitation;
- Management of public lands;
- Population control and population distribution;
- Federal activities conducted outside the United States (except that scientific activities financed under the special foreign currency program are included);
- Activities to reduce or avoid the use of pesticides;
- Increased cost of new facilities and low-polluting fuels (e.g., low-sulfur coal) to meet pollution control standards; and
- Highway beautification program.

APPENDIX H

# Advisory Committees of the Council on Environmental Quality

In addition to the Presidentially appointed Citizens' Advisory Committee on Environmental Quality, the Council has appointed the Advisory Committee on Alternative Automotive Power Systems. As required by Executive Order 11007, the members, a brief description of their functions, and the dates of their meetings are listed below.

## Citizens' Advisory Committee on Environmental Quality

### Functions

Established by Executive Order 11472, May 29, 1969, the committee advises the President and the Council on Environmental Quality on all aspects of environmetnal quality and recommends actions by Federal, State, and local governments and by the private sector. The Council consults with the Committee pursuant to section 205 of the National Environmental Policy Act (42 U.S.C. § 4345).

*Chairman*

Henry L. Diamond
Commissioner
New York State Department of Environmental Conservation
Albany, N.Y.

*Members*

Colonel Frank Borman
Senior Vice President
Eastern Air Lines, Inc.
Miami, Fla.

Robert Cahn
Environmental Editor
The Christian Science Monitor
Washington, D.C.

René Dubos
Rockefeller University
New York, N.Y.

Jean Fassler
Supervisor, San Mateo County
Redwood City, Calif.

Professor E. Corinne Galvin
Ithaca College
Ithaca, N.Y.

James S. Gilmore, Jr.
President
Gilmore Broadcasting Corporation
Kalamazoo, Mich.

Arthur Godfrey
Arthur Godfrey Productions
New York, N.Y.

Charles A. Lindberg

Governor Tom McCall
Salem, Oreg.

Jack B. Olson
Olson Boat Company
Wisconsin Dells, Wis.

Laurance S. Rockefeller
Chairman
Rockefeller Brothers Fund
New York, N.Y.

Willard F. Rockwell, Jr.
Chairman
North American Rockwell Corporation
Pittsburgh, Pa.

Lelan F. Sillin, Jr.
President and Chairman
Northeast Utilities
Hartford, Conn.

Mayor Pete Wilson
San Diego, Calif.

## Meetings

July 21, 1972, Washington, D.C.
September 5, 1972, San Francisco, Calif.
October 27, 1972, Washington, D.C.
December 15, 1972, San Diego, Calif.
March 23, 1972, Washington, D.C.
June 29, 1973, Washington, D.C.

## Advisory Committee on Alternative Automotive Power Systems

### Functions

The Committee advises the Council on research and development programs and other technical progress toward developing low-emission, surface-vehicle power systems as alternatives to the present internal combustion engine.

*Chairman*

Dr. David O. Ragone
Dean, Thayer School of Engineering
Dartmouth College
Hanover, N.H.

*Members*

James L. Dooley
Vice President, Engineering
McCulloch Corporation
Los Angeles, Calif.

Dr. S. William Gouse, Jr.
Associate Dean
Carnegie Mellon University
Pittsburgh, Pa.

Dr. George J. Huebner, Jr.
Director of Research, Product Planning and Development
Chrysler Corporation
Detroit, Mich.

David F. Moyer
Director, Systems Research Laboratory
Ford Motor Company
Dearborn, Mich.

Professor Robert F. Sawyer
Department of Mechanical Engineering
University of California
Berkeley, Calif.

Ernest Starkman
Vice President-Environmental Activities Staff
General Motors Corporation
Warren, Mich.

Dr. John H. Sununu
Associate Dean, College of Engineering
Tufts University
Medford, Mass.

*Government Liaison Members*

Dr. Joseph Coates
Program Manager, Exploratory Research and Problem Assessment
National Science Foundation
Washington, D.C.

Robert English
Chief, Power Systems Division
National Aeronautics and Space Administration
Cleveland, Ohio

William B. Foote
Deputy Commissioner for Transportation
Transportation and Communications Service
General Services Administration
Washington, D.C.

Lewis Gerlach
Chief of Transportation Research
U.S. Postal Service
Washington, D.C.

Jack Hope
Technical Assistant to Director
Office of Science and Technology
Washington, D.C.

George D. Kittredge
Office of Air and Water Programs
Environmental Protection Agency
Washington, D.C.

Dr. William Kirchoff
Deputy Manager, Measures for Air Quality
National Bureau of Standards
Washington, D.C.

Dr. Ernest N. Petrick
Chief Scientist
U.S. Army Tank-Automotive Command
Warren, Mich.

Joel Rosenblatt
Examiner, Natural Resources Programs Division
Office of Management and Budget
Washington, D.C.

Dr. Richard L. Strombotne
Department of Transportation
Washington, D.C.

*Previous Members*

Professor David O. Harris
Professor Frederick J. Hooven
Dr. Wolf Koch
Dr. Craig Marks
Professor William Mirsky

*Previous Government Liaison Members*

Dr. S. William Gouse, Jr.
Dr. Lawrence A. Goldmuntz
Dr. James R. McNesby
Valentine Russack
Glenn Schleede
Dr. Louis Schoen
Henry O. Stone

## Meetings

October 23–24, 1972, Ann Arbor, Mich.
January 29–30, 1973, Berkeley, Calif.
May 31, 1973, Washington, D.C.

# Photo Credits

Virginia Electric and Power Company: 3
Dallas Chamber of Commerce: 4
Environmental Protection Agency: 7
Jon Maguire for Architectural Heritage, Inc.: 8
Phillip MacMillan James & Associates: 10
Ronald Comedy for the Historic American Buildings Survey (top), Bill Hedrich, Hedrich-Blessing (center), Heinz Hall for the Performing Arts (bottom): 12
Ron Green: 14–15
Lawrence Halprin & Associates: 16
*The New York Times*: 17
San Francisco Convention & Visitors Bureau: 18
San Antonio Chamber of Commerce: 19
Lawrence Halprin & Associates: 20
Boston Redevelopment Authority: 21
Redevelopment Authority of the City of Philadelphia (top), Donald Naismith (bottom): 25
Marcou, O'Leary and Associates, Inc.: 26
Robert S. Scurlock for the National Trust for Historic Preservation: 28
Carleton Knight III for the National Trust for Historic Preservation (top), Day Johnston for Margaret Larson (bottom): 30
Pat Mullaly, from "Old West Side: A Report on the Environmental Survey of a Neighborhood": 31
C. C. Withers for the Institute of Contemporary Art, Boston: 33
Karl H. Riek for Marquis & Stoller: 37
The National Trust for Historic Preservation: 38
Oregon State Highway Department: 52
Oregon State Highway Department: 58
Oregon State Highway Department: 61
Oregon State Highway Department: 68
Environmental Protection Agency: 75
Environmental Protection Agency: 77
University of Florida, Photographic Laboratory: 84
Environmental Protection Agency: 85
Kevin J. Brown, courtesy of *The Use of Land*: 123
Kevin J. Brown, courtesy of *The Use of Land*: 124
Environmental Protection Agency, Documerica, Gene Daniels: 158
Environmental Protection Agency, Documerica, Marc St. Gil: 160
Environmental Protection Agency: 169
Environmental Protection Agency, courtesy *Des Moines* (*Iowa*) *Register*: 173
Environmental Protection Agency: 181
Environmental Protection Agency, Documerica, Gene Daniels: 184
Department of Agriculture: 186
Environmental Protection Agency: 192
Environmental Protection Agency: 196

Environmental Protection Agency, Documerica, Bruce McAllister: 201
Environmental Protection Agency: 203
Environmental Protection Agency, Documerica, Charles O'Rear: 206
Department of Commerce, *Commerce Today*: 208
Environmental Protection Agency, Documerica, Marc St. Gil: 210
Department of the Interior, National Park Service: 217
Richard K. Dean, courtesy of the Wilderness Society (top), Kevin J. Brown, courtesy of *The Use of Land* (bottom): 218
Karl W. Kenyon, courtesy of the Department of the Interior, Bureau of Sport Fisheries and Wildlife: 224
Department of Agriculture, Forest Service: 226
Department of the Interior, National Park Service: 229
Department of Commerce, Maritime Administration: 330
Department of Commerce, *Commerce Today*: 334
Department of Commerce, *Commerce* Today: 338
Department of Commerce, courtesy of the Wilderness Society: 342
Luther C. Goldman, courtesy of the Department of the Interior, Fish and Wildlife Service: 343
Department of Commerce, National Oceanic and Atmospheric Administration: 345
Department of the Interior, National Park Service: 348
Department of Commerce, Maritime Administration: 364
Department of Commerce, National Oceanic and Atmospheric Administration: 369
U.S. Coast Guard: 377
Environmental Action, Inc., Daniel S. Brody: 378
Environmental Protection Agency, Documerica, Bill Gillette: 379
Environmental Protection Agency, Documerica, Jim Olive: 382
J. Felix Lehmkuhle: 384
Sam Silverman, courtesy of the Wildness Society: 388
Sharron C. Demarest, courtesy of the Environmental Action Coalition: 392
Sanibel-Captiva Conservation Foundation, Inc.: 396
Department of Agriculture, Soil Conservation Service: 403

# Index

A

Actors Theatre of Louisville, Ky.: 9
Advisory Committee on Alternative Automotive Power Systems: 478
AFL–CIO: 377
African Convention Relative to the Preservation of Flora and Fauna in their Natural State (1935): 343
Agreement on Cooperation in the Field of Environmental Protection Between the United States and the USSR: 349, 365
Agriculture. *See* Land Use.
Agriculture Dept.: 228, 242
Aircraft. *See* Transportation.
Air Force: 247
Air Quality
  Annual average air quality: 271
  Automobile-related pollutants: 272
  Carbon dioxide concentrations: 277, 278
  Damage cost estimates: 77
  Detroit-Windsor area: 339
  Global trends: 277
  Indices: 275
  Lawsuits: 161, 166
  Monitoring of
    Ambient air quality: 271, 272
    Drawbacks of data: 274
    Emissions: 265
    Lawsuits: 166
    National Emissions Data System: 267
    Problems: 265
  Port Huron-Sarnia: 339
  Priority ranking of control regions: 275
  Private investment in controls: 88
  Private spending: 95, 96
Air Quality—Continued
  Regional studies: 363
  Results of EPA data: 167
  Studies: 80
  Threshold of harm: 271
  Transportation pollution: 266
  Trends: 324
  U.S.-USSR cooperation: 366, 367
Alabama: 247
Albany, N.Y.: 9
Albany, Oreg.: 47
American Society of Planning Officials: 310
Amchitka Island: 294
Angel Falls (Venezuela): 347
Ankara, Turkey: 363
Ann Arbor, Mich.: 31
Areas of Unique Value: 341, 347
Arizona: 386
Army Corps of Engineers
  Flood plain development: 313
  Impact statements: 242, 245
  Impact statement compliance: 247
  Trinity River Basin projects: 237
  Water quality and: 59
  Willamette and: 51, 53
Arsenic: 201
Asbestos Pollution: 290
Askew, Reuben: 231
*Askew* v. *American Wateways Operators*: 180
Association of Bay Area Governments: 222
Atlanta, Ga.: 5, 7, 17
Atlantic Ocean
  Oil and plastic pollution: 293, 330
  Sediment in: 317
  Synthetic chlorinated hydrocarbons in: 294

Atlantic Ocean—Continued
  Tar balls: 293
Atomic Energy Act of 1954: 182
Atomic Energy Commission
  Impact statements: 242
  Licensing of powerplants: 195
  Liquid metal fast breeder reactor: 241
  Nuclear fuel cycle: 194, 195
  Powerplant discharges: 191, 192
  Radiation control regulations: 97
  Radioactive waste storage: 246
  Rulemaking hearings: 189, 194
Audubon, John James: 374
*Aunt Hack Ridge Estate, Inc.* v. *Planning Commission of the City of Danbury*: 140
Austin-Waco, Tex.: 157
Automobile Pollution
  Catalyst-based emission control system: 164
  Control of: 113
  Emission control standards extension: 163
  Emission control technology: 249
  Emission reduction: 156
  Emissions in urban areas: 268, 269, 270
  Energy and: 162
  Technology studies: 164, 165
  Trends: 324
  Types of: 272
  U.S. economy and: 163

**B**

Babcock, Lyndon: 267, 271
Balance of Payments: 209
Bald Eagle: 224
Baltic Sea: 340
Baltimore, Md.
  Air quality plan: 157
  Flood of 1971: 320
  Flood plain development: 313
  Land use patterns: 303
  Neighborhood studies: 32
  Nitrogen oxide levels: 166
  Relation to Wash., D.C.: 301
  Resource recovery: 202, 203
Baltimore Gas and Electric Co.: 203
*Bartlett* v. *Zoning Commission*: 135, 149
Baton Rouge, La.: 157
Beaumont, Tex.: 157
Belgium: 348, 357, 360, 363
Big Cypress Swamp (Fla.): 228, 229, 230, 231
Bill of Rights: 127
Birmingham, Ala.: 157
Black Sea: 340, 365
Black-Clawson Process: 203, 204
Blue Whale Unit: 345
Boca Raton, Fla.: 220
Boston, Mass.
  Air quality plan: 157
  Beacon Hill: 23
  Boston Common: 13
  Government Center: 5
  Land use: 300
  Old City Hall: 8, 9
  Park entertainment: 33
  Restored neighborhood: 21
  Vest pocket parks: 33
  West End: 35
Boulder, Colo.: 125, 220
Brandeis, Justice Louis: 132, 133, 144
Bridge Canyon Dam: 375, 376
Brooklyn, N.Y.: 27
Bryant, William Cullen: 330
Budget, Federal: 463
Bulgaria: 340
Bureau of Land Management: 247
Bureau of Sport Fisheries and Wildlife: 289
Businessmen for the Public Interest (Chicago): 388
Busterud, John: 405

**C**

*Cache River* Case: 239
California
  Coastal Zone Conservation Act: 222
  Coastal zone protection: 216, 217
  Emission control standards: 164
  Land use reform: 216
  Recreational land sales: 219
  Taking issue: 135
  Water quality permit: 175
  Wetlands: 312
California Tomorrow: 386
Calvert Cliffs State Park: 395
Canada: 285, 338, 348, 360
*Candlestick Properties, Inc.* v. *San Francisco Bay*: 135, 137
Cape Matutula, American Samoa: 277
Cement Plants: 160
Central Atlantic Environment Center: 389
Charleston, S.C.: 24
Chase Econometric Associates: 107, 361
Chatfield Dam: 313
Chesapeake Bay: 390, 395

Chicago, Ill.
  Auditorium Theatre: 11, 12
  Businessmen for the Public Interest: 388
  Detergent pollution: 177, 178
  Grant Park: 13
  Nitrogen oxide concentrations: 166
  Renewal neighborhoods: 35
*Chicod Creek* Case: 237
Chinook Salmon: 54, 59
Chlorides: 285, 286
Cincinnati, Ohio
  Air quality plan: 159
  Airport: 199
  Mount Auburn: 30, 31
  Waterfront renewal: 9
Citizen Action
  Activities of environmental groups: 387, 388
  Budget trends of groups: 398, 399, 400
  Citizen enforcement: 395
  Clean Air Act: 176, 177
  Commitment of members to: 402
  Community organizations: 380
  Federal level: 390
  First registered lobbyist: 390
  Grants for: 401
  Growth and diversification of: 402
  Importance of: 251, 403
  Individual action: 391, 392
  Information dissemination: 389
  Land purchase and: 396
  Land use regulation and: 377
  Legal action: 393–395
  National organizations: 386
  NEPA impact statements and: 394, 395
  Number of groups: 396
  Political action and: 390–392
  Problems of: 398
  Publications: 389
  Recycling: 392, 393
  Regional service centers: 386
  Size of groups: 397
  Socioeconomic status and: 379
  State coordinating councils: 384
  State level: 391
  Tax-deductible status of groups: 399
  Urban Environment Conference and: 378
  Water quality: 171
  Workers in: 398
  Youth groups: 381
  *See also* Environmentalism.
Citizens' Advisory Committee on Environmental Quality: 476
Citizen's Crusade for Clean Water: 376, 377
Citizens Environmental Council (Kansas City, Mo.): 393
*City of Burbank* v. *Lockheed Air Terminal, Inc.*: 198
Civil Defense and Emergency Preparedness, Office of: 320
Clean Air Act
  Auto emission control: 113, 164
  Auto emission reduction: 156
  Citizen action: 176, 177
  Citizen suits: 395
  Damage and abatement costs: 109
  Effects of: 155
  Energy sources and: 161
  Impact of: 167
  Land use and: 159, 160
  National ambient air quality standards: 155
  National data for: 156
  Powerplant siting controls: 160
  Primary standards: 155
  Secondary impacts: 156
  Solid waste management: 204
  Wildlife and: 223
Coal: 161, 209
  Clean Air Act and: 161
Coastal Zones: 216
Coastal Zone Management Act of 1972: 214
Collier County, Fla.: 221
Colorado: 211, 386
Colorado River: 317, 339
Columbia LNG Corporation: 395
Columbus, Ohio: 27
Comite Special de l'Annee Geophysique Internationale: 362
Commerce Dept.: 104, 212
  Energy conservation program: 210
CONCERN, Inc.: 390
Connecticut: 123, 135, 137, 140, 205, 391
Conservation Council of Virginia: 385, 390
*Conservation Council* v. *Froehlke*: 239
Conservation Foundation: 386, 389
Consolidated National Intervenors: 193
*Consolidated Rock Products Co.* v. *City of Los Angeles*: 143
Consolidated Utilities: 193
Constitution
  Fifth amendment: 122

Constitution—Continued
  Property rights and: 125
Convention Concerning the Conservation of Birds Useful to Agriculture (1902): 342
Convention for the Regulation of Whaling (1931): 344
Convention on International Trade in Endangered Wild Flora and Fauna: 224, 342, 344
Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere (1942): 343
Corvallis, Oreg.: 47, 292
Corpus Christi, Tex.: 157
Cost Factors. *See* Environmental Policy, Costs.
Council for Mutual Economic Assistance: 365
Council of Europe: 364, 365
Council of State Governments: 248
Council on Environmental Quality
  Advisory committees: 476
  Agency performance on impact statements: 245
  Annual review of NEPA compliance: 246
  Emergency core cooling system: 194
  Energy conservation program: 212
  Impact of abatement costs on prices: 104
  Impact statement distribution: 236
  Impact statement guidelines: 234, 416
  Land use studies: 316
  Legislation for: 410
  PCB study: 188
  Pest management study: 186
  Recreational land sales study: 219
  Resource recovery: 202
  Supertankers in domestic deepwater ports: 211
Council on State Goals and Policy (N.C.): 263
Cross-Florida Barge Canal: 227, 393
Cypress Creek Watershed Project (Ala.): 247

**D**

Dade County, Fla.: 221
Daimler-Benz: 164
Dallas, Tex.
  Downtown area: 4
  Cumberland Hill School: 11
Dallas-Fort Worth, Tex.
  Air quality plan: 157
Danube River: 340
Dayton, Ohio: 159
DDT: 183–185, 294, 336
Declaration on the Human Environment (1972): 338
Dedham, Mass.: 136
*Defensible Space*: 38
Delaware Bay: 179
Delaware River: 80
Delaware: 214, 215, 389
Denver, Colo.: 11, 159, 303, 307, 309, 310, 313
DES: 393
Des Moines, Iowa: 173
Detergent Pollution: 177, 178
Detroit, Mich.: 16, 173
Detroit River: 284, 285, 286
Detroit-Windsor: 339
Development Sciences, Inc.: 295
Diesel Engines: 164
Dinosaur National Monument: 375
District of Columbia. *See* Washington, D.C.
Don't Tear It Down (Washington, D.C.): 24
*Dooley* v. *Town Plan & Zoning Commission*: 135, 149

**E**

Earth Day
  Importance to high school groups: 383
  Importance to youth: 381
  Organizations and: 380
  Recycling and: 392
Earth Satellite Corporation: 302, 303, 311, 313, 314
Earthwatch: 277, 369
Eastern Wilderness Amendments of 1973: 227
Echeverria, Luis: 339
Echo Park Dam (Colo.): 375, 390
Economic Commission for Europe: 340, 365
Economic Research Service: 306
Economics. *See* Environmental Policy, Costs.
*Economics of Clean Air* (EPA): 95
Economy, U.S.: 163
El Centro, Calif.: 159
El Paso, Tex.: 157
Emerson, Ralph Waldo: 374
Emissions. *See* Automobile Pollution.
Endangered Species
  Legislation on: 223
  Plants: 224
  U.S.-USSR Cooperation: 366
Endangered Species Conservation Act: 343
Endangered Species Preservation Act of 1966: 223

- ENDEX. *See* National Oceanic and Atmospheric Administration.
- Energy
  - Automobile emissions and: 162
  - Clean Air Act and: 161
  - Conservation of: 212
  - Increased supply of natural gas: 209
  - Increased use of coal: 209
  - Interrelationships in energy policy: 205
  - New initiatives: 208, 209
  - New sources of: 211, 212
  - Nixon on: 213
  - Powerplant construction delays: 207
  - Powerplant siting: 160, 211, 215
  - Reasons for shortages: 207
  - Supply problem: 206
- Energy and Natural Resource Department: 213
- Energy Policy Office: 213
- Energy Research and Development Administration: 213
- Enviro Control Study: 293
- Environment/Alaska: 386
- Environmental Action, Inc.: 386, 389, 390
- Environmental Baselines: 294
- Environmental Coordination Board: 369
- Environmental Defense Fund: 228, 393
- *Environmental Defense Fund* v. *Army Corps of Engineers*: 238
- *Environmental Defense Fund* v. *Froehlke*: 239
- Environmental Impact Statements. *See* Impact Statements.
- Environmental Indices: 263
- Environmental Information Center (Fla.): 386
- Environmental Information System: 264
- Environmental Law Society (Univ. of Mich.): 395
- Environmental Policy
  - Cost-effective implementation: 113
  - Costs
    - Abatement costs: 74, 84, 85. 101, 104, 105
    - Air pollution damage cost estimates: 77
    - Avoidance costs: 74
    - Cumulative costs: 98
    - Damage costs: 74, 82
    - Equity in distribution of: 111
    - Federal subsidies for: 114
    - Financing methods: 101

- Environmental Policy—Continued
  - Costs—Continued
    - Future abatement costs: 90, 91
    - Impact of new regulations: 91, 92
    - Impact on different sectors: 110
    - Incremental costs: 100, 101
    - Irreversible consideration: 111, 112
    - Percentage of Federal spending: 87
    - Percentage of state and local expenditures: 86, 87
    - Private sector spending: 87, 88, 104
    - Public sector spending: 86, 101
    - Quantification of: 117
    - Recreation: 86
    - Study of private investment in: 88
    - Tax-exempt industrial revenue bonds: 105, 116
    - Transaction costs: 74, 83, 84
    - Trends in: 86
    - Water treatment: 86
  - Economics and policy evaluation: 109
  - Impact of pollution abatement costs: 107
  - Incentives to implementation: 113
  - Public opinion and: 81
- Environmental Policy Center: 378, 387, 390
- Environmental Protection Agency
  - Aircraft and airport noise studies: 97, 197, 198
  - Air quality lawsuits: 161, 166
  - Air quality monitoring: 166
  - Air quality plans: 157
  - Automobile engines: 213
  - Clean Air Act extensions: 155
  - Energy conservation program: 212
  - Enforcement authority: 170
  - Eutrophication study: 292
  - Fossil fuel plant standards: 160
  - Fuel generating plant standards: 160
  - Impact of abatement costs on prices: 104
  - Mission 5000: 266
  - National Emissions Data System: 267
  - Noise limits: 199, 200
  - Radiation guidelines: 190
  - Region IV: 280, 282
  - Regional air quality stations: 277
  - Resource recovery demonstration projects: 203

Environmental Protection Agency—Continued
  Results of air quality information: 167
  Solid waste grants and research: 200
  Storage and Retrieval of Aerometric Data: 264
  Strategic Environmental Assessment System: 297
  Toxic pollutant discharge standards: 175
  Water quality permit system: 175
  Water status and trends studies: 284
  "Water Strategy Paper": 176
Environmental Protection Programs
  Courts and: 250
  Importance of citizen support: 251
  Institutions and: 249
  Technology and: 249
  Secondary impacts of: 249
Environmental Protection Tax Act: 215
Environmental Quality Improvement Act of 1970 (P.L. 91–224): 413
Environmental Teach-In: 381
Environmentalism
  Early history of: 373
  New approaches: 376
  New issues: 376
  Philosophical foundation of: 374
  Socioeconomic status and: 379
  Urban issues: 378
  *See also* Citizen Action.
Erosion
  Extent of: 317
  Sediment discharged into the oceans: 317
  Studies of: 316, 317
Eugene, Oreg.: 47, 49, 51, 53, 60
Europe: 340, 370
European Conservation Year (1970): 364
Everglades National Park: 229, 231
Executive Order 11296: 313
Executive Order 11643: 225
Extreme Value Index: 275

F

Fairbanks, Alaska: 157
Fairfax County, Va.: 221
Fauquier County, Va.: 221
Federal Aviation Act Amendments of 1968: 197
Federal Aviation Administration: 198, 245
*Federal Environmental Monitoring Directory* (CEQ): 264
Federal Environmental Pesticide Control Act: 183, 185
Federal Highway Administration: 245
Federal Housing Administration: 212
Federal Insecticide, Fungicide and Rodenticide Act of 1947: 183
Federal Power Commission: 242
Federal Radiation Council: 190
Federal Republic of Germany: 340, 348, 360, 363, 367
Federal Swamp Land Acts: 311
Federal Water Pollution Control Act Amendments of 1972
  Aims: 172
  Cost impact of: 91, 92, 95, 96
  Fish and: 223
  Influences on the law: 171
  Marine pollution and: 336
  Monitoring data: 284
  Oceans and high seas and: 178, 179
  Permit system: 280
  Pre-1965 efforts: 168
  Requirements of: 168
  Summary: 169
  Water pollution investment: 89
  Willamette pollution and: 69
Federal Water Pollution Control Administration: 58
Fedorov, E. K.: 366
Finland: 340
First National Bank of Minneapolis: 264
Fish and Wildlife Coordination Act: 223
Flint, Mich.: 384
Flood Plain Management Services Program: 313
Flood Plains: 215, 219, 312, 313
Florida: 125, 214, 215, 251
Food and Drug Administration: 188, 393
Ford Foundation: 263
Forest Service: 227
France: 340, 348, 357, 360, 363
Frankfurt, Germany: 363
Franklin, Ohio: 203
Fresno, Calif.: 15, 159
Friends of the Earth: 386, 389, 390

G

Gateway National Recreation Area: 232

Geneva Convention on Fishing and Conservation of the Living Resources of the High Seas (1958): 337
Geneva Convention on the High Seas (1958): 337
Geneva Convention on the Territorial Sea and the Contiguous Zone (1958): 337
General Accounting Office: 245
General Services Administration: 212, 242
Geological Survey: 283, 317, 318, 324
George Washington University Law School: 239
Geothermal Stream Act of 1970: 212
Get Oil Out, Inc.: 380
*Gilham Dam* Case: 238
Gingko Tree: 342
Glen Canyon, Ariz.: 112
*Goldblatt* v. *Hempstead*: 128, 143
Golden Gate National Recreation Area: 232
GOO. *See* Get Oil Out, Inc.: 380
Grand Canyon National Park: 375
Grand Portage Indian Reservation: 247
Great Dismal Swamp: 231
Great Lakes
  Asbestos pollution of: 290
  Biological productivity of: 288
  Changes in: 288, 289
  Fish production of: 290
  Growth around: 287
  Pollution of: 285, 287
  Trophic classification of: 288
Great Lakes Fishery Commission: 289
Great Lakes Water Quality Board: 339
Greater Miami Tree Conservation Bank: 14
Greece: 340
Green Bay, Wis., 291
Greenway
  Administration of program: 63
  Concept: 44, 62
  Federal aid to: 64
  Financing of: 64, 65
  Future of: 66
  Goals of: 62, 63
  Issues involved: 66
  New legislation for: 65
  Opposition to: 63
  Originator of: 57
  Problems of: 63, 64
Greenway—Continued
  Recent developments: 64, 65
  *See also* Willamette River.
Gulf of Mexico: 294, 317, 393

**H**

*Hadacheck* v. *Sebastian*: 131, 143–145
Hallandale, Fla.: 220
Harrisburg, Oreg.: 51
Harvard Law School: 396
Hazardous Pollutants. *See* Toxic Substances.
Hazardous Wastes. *See* Solid Waste Disposal.
Hazardous Waste Management Act: 202
Heady, Earl: 296
Hetch-Hetchy Valley: 374
Heyerdahl, Thor: 330
Hillsborough County, Fla.: 311, 314, 315
Historic and Archeological Sites: 141
History and Landmarks Foundation (Pittsburgh): 31
Hollywood, Fla.: 220
Holmes, Justice Oliver Wendell: 132, 133
Honda: 164
Housing and Urban Development, Dept. of: 212
Houston-Galveston, Tex.: 157
Huntington Woods, Mich.: 204
Hurricane Agnes: 320

**I**

Idaho: 386
Illinois: 141
Illinois River: 178
Impact Statements
  Administrative developments: 242
  Agency participation in: 236
  CEQ Guidelines for: 234
  Court developments: 236–242
  Decisionmaking and: 246
  Guidelines for: 416
  Number, by agency: 242, 244
  Number, by type of action: 243
  Public participation in: 235
  Quality of: 245
  Responsible agencies: 429
  State level organizations: 248
  Technology assessment and: 241
  Transaction costs and: 84
Impervious Surfaces. *See* Land Use
India: 341, 367

Indiana: 318, 319
Indianapolis, Ind.: 157
Industrial Revenue Bonds: 361
Integrated Pest Management
  Demonstration projects: 187
  Federal program: 187
  Goals of: 186
  International cooperation on: 187
  Service industry: 187
  Technology for: 249
  University training programs in: 187
  *See also* Pesticides.
*Integrated Pest Management* (CEQ): 186
Inter-Governmental Maritime Consultative Organization: 332, 333
Internal Revenue Code: 9
International Conference on Pest Management: 187
International Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter: 179
Interior Dept.: 210, 242, 264
  Impact statements: 242
International Association of Academies (1901): 362
International Bureau of Whaling Statistics: 344
International Center for the Study of the Preservation and Restoration of Cultural Property: 347
International Commission for Protection of the Rhine Against Pollution: 340
International Congress of Chemistry (1860): 362
International Congress of Geodesy (1862): 362
International Convention on Civil Liability for Oil Pollution Damage: 333
International Convention on Parks (1933): 347
International Convention for the Prevention of Pollution of the Sea by Oil (1954): 332
International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties: 333
International Council for Exploration of the Sea (1902), 365
International Council of Monuments and Sites: 347
International Council of Scientific Unions (1931): 362
International Decade of Ocean Exploration: 294
International Environmental Action
  Areas of unique value: 347, 348
  Bilateral agreements: 365, 366
  Early history of: 329
  International trade and
    Comparative costs of environmental controls: 349–355, 357
    Comparative environmental standards: 349, 357
    Depreciation policy and: 360
    Government subsidies and: 358
    Impact of environmental standards on: 361
  Land-based pollution of the seas: 336
  Methods of measurement and: 357
  National environmental programs of other nations: 348, 349, 350–355
  Ocean dumping: 335
  Oil pollution: 332
  Pooling of scientific data: 362
  Protection of whales: 344
  Regional organizations: 362, 363, 370
  Transboundary pollution: 337, 338, 340, 370
  Wildlife and areas of unique value: 342
International Field Year for the Great Lakes: 292
International Geophysical Year: 362
International Great Lakes Water Quality Agreement: 292
International Health Conference (1853): 362
International Hydrological Decade: 362
International Paper Company: 219
International Polar Years (1882–83): 362
International Union for the Conservation of Nature and Natural Resources (1948): 343, 347
International Whaling Commission: 345, 346
Interstate Commerce Commission: 239
Interstate Land Sales Full Disclosures Act: 219
Italy: 348
Izaak Walton League: 50, 376, 395

J

Jacobs, Jane: 33
Jacobs-Hochheiser Procedure: 272

Japan: 345–349, 357, 359, 360, 363, 367
Jefferson, Thomas: 374
Junction City, Oreg.: 51
*Just v. Marinette County*: 147, 149

K

Kansas City, Kans.: 157, 303, 309, 310, 313
Kansas City, Mo.: 393
Kansas River, Kans.: 293
Kennecott Copper Company: 166
Keystone Associates: 141, 142

L

Labor Dept.: 189
Lake Cochituate Waterland Association, Inc.: 388
Lake Erie: 285, 287, 289, 339
Lake Eutrophication. *See* Great Lakes; Water Quality.
Lake Huron: 289, 291, 292
Lake Michigan: 178, 192, 287, 289–291
Lake Ontario: 291
Lake Oswego, Oreg.: 59
Lake Superior: 289, 290–292
Lake Tahoe Basin: 125
Land and Water Conservation Fund: 64, 233
Land Use
  Agricultural land: 306–308
  Availability of land: 305–308
  "Carrying capacity": 295
  Citizen role: 377
  Context of decisionmaking: 320, 321
  Distribution of economic growth and: 159
  Growth limits: 220, 222
  Impact of on pollution: 316
  Impervious surfaces: 318
  Importance of: 295
  Indicators of: 295
  Landmark preservation: 141
  Local governments and: 122
  Metropolitan areas: 297, 298, 299
  Metropolitan patterns: 303
  Models for: 296
  National indicators: 320
  National trends in: 297, 298
  New trends: 122
  Nixon on: 126
  Open space and parks: 308–310
  Open space preservation: 140
  Population trends and: 298, 302
Land Use—Continued
  Private property, evolution of: 149, 150
  Private property vs. environmental concerns: 125
  Problems of: 297
  Property tax reform: 214
  Proposed Federal legislation: 214
  Public domain: 214, 215
  Recreational land sales boom: 219, 220
  Regulating growth and development: 137, 138
  Role of planning: 66
  Shifting needs: 67
  "Spread city": 324
  State land use laws: 215
  Taking issue
    Balancing theory: 131, 132
    Cases: 126, 128, 129
    Critical natural features theory: 146
    Definition: 122
    Diminution of value theory: 132, 138, 142, 143
    Moratorium theory: 147, 148
    Nuisance abatement theory: 130, 142, 144, 146
    Physical invasion theory: 129, 142
    Recreational lands and: 220, 221
    Role of legislature: 148
    Trends: 134
    Wetlands cases: 134, 146
  Trends in agricultural land: 306–308
  Unsuitable soils: 314
  Urban areas and: 67
  Water quality improvement and: 44, 69
  Willamette and: 60
  World demand for U.S. agricultural products: 307, 308
  *See also* Erosion; Flood Plains; Greenway; Mining; Wetlands.
Law of the Sea Conference: 337, 370
Lead: 182, 201
League of Conservation Voters: 251, 390
League of Women Voters: 377, 387, 395
Lebanon, Ohio: 380
Lebanon, Oreg.: 49
Legacy of Parks Program: 232, 233
Leopold, Aldo: 389
Linville Gorge, N.C.: 226
Little Miami, Inc.: 380

Livermore, Calif.: 222
Lloyd Harbor Group: 193
Los Angeles, Calif.
  Aircraft noise: 76
  Land use patterns: 303
  Nitrogen oxide levels: 166
  Smog: 159, 272
  Toxic substances disposal: 179
Louisville, Ky.: 9, 27, 29
Low Cost Housing Corporation (Boston): 30
Luxembourg: 340
Lyons, Kans.: 246

**M**

Madison, James: 127, 128
Maine: 134, 193, 214, 391
*Maine* v. *Johnson*: 134
Maine Site Selection Act: 222
Man and the Biosphere: 368
*Man and Nature*: 374
Manchester, N.H.: 212
Marine Mammal Protection Act of 1972: 224, 346
Marine Pollution
  Baltic Sea: 340
  Black Sea: 340
  Extent of: 335
  Land-based pollution of: 336
  Law of the Sea Conference: 337
  Marine food chain contamination: 294
  Ocean dumping: 178, 179, 335
  Oil spills: 180
  Oslo Convention: 336
  Polychlorinated biphenyls and pesticides: 294
  Priorities in: 336
  Studies of: 293
  Tar balls: 293
  U.S. legislation: 178, 179
  *See also* Oil Pollution.
Marine Protection Research and Sanctuaries Act: 294
Markets. *See* Urban Environment.
Marsh, George Perkins: 374
Martin County, Fla.: 221
Maryland: 216, 389, 390, 395
Maryland Conservation Council: 395
Maryland Wetlands Act: 222
Massachusetts
  Local conservation commissions: 391
  Nantucket Conservation Foundation, Inc.: 388
  Taking issue: 123, 135
  Toxic substances disposal: 179
  Wetlands protection: 391
Massachusetts Zoning Appeals Law: 222
Mauna Loa, Hawaii: 277, 278, 279, 369
McCall, Tom: 57, 62, 67
McGraw-Hill: 88, 89
Mercedes-Benz: 164
Mercury: 182
Mexico: 339
Michigan Land Sales Act: 219
Milan, Italy: 363
*Miller* v. *Schoene*: 145
Milu Deer: 342
Milwaukee, Wis.: 29
Mined Area Protection Act: 97, 209
*Mineral King* Case: 240, 241
Mineral Leasing Act of 1920: 230
Mining: 97, 318
Minneapolis, Minn.
  Air quality plan: 157
  Cedar-Riverside: 35
  Downtown: 6
  Nicollet Maul: 14–16
Minnesota: 193
Minnesota Public Interest Research Group: 382
Mississippi River: 317
Missouri: 310
Mitre Air Quality Index: 275
Mobile, Ala.: 157
Monsanto Company: 188
Montana: 386
Montgomery County, Md.: 221, 247, 314, 315
*Morris County Land Improvement Co.* v. *Parsippany-Troy Hills*: 134, 137
Mt. Agung Volcano: 278
Mt. Hood, Oreg.: 52
*Mugler* v. *Kansas*: 128, 130, 144, 146, 147
Muir, John: 375, 389

**N**

Nader, Ralph: 389
Nantucket Conservation Foundation, Inc.: 388
Narragansett, R.I.: 221
Natick, Mass.: 388
National Academy of Sciences
  Emission control technology: 163, 164
  Radiation study: 189
National Audubon Society: 386, 395
National Bureau of Standards: 212
National Center for Resource Recovery: 203

National Center for Voluntary Action: 379, 398
National Endowment for the Arts: 32
National Environmental Policy Act: 223, 408
National Flood Insurance Act of 1968: 215
National Historic Preservation Act: 141
National Oceanic and Atmospheric Administration
  Air quality monitoring: 276
  Environmental baselines: 294
  Environmental Data Index: 264
  Marine pollution studies: 293
  Oil and plastic pollution: 330
  Regional air quality stations: 277
National Pollutant Discharge Elimination System: 175
National Parks Association: 376
National Sanitation Foundation: 293
National Science Foundation: 264, 294, 296
National Stream Quality Accounting Network: 283
National Technical Information Service: 236
National Tenants Association: 378
National Trust for Historic Preservation: 32
National Welfare Rights Organization: 378
National Wild and Scenic Rivers System: 227
National Wilderness Preservation System: 225
National Wildlife Federation: 380, 386, 389
National Wildlife Refuge: 232
NATO Committee on the Challenges of Modern Society
  Activities of: 363
  Oil pollution and: 333
  St. John River Basin pollution: 339
Natural gas: 209, 395
Natural Resources Defense Council: 389, 393, 402
*Natural Resources Defense Council v. Grant*: 237
Nature Conservancy: 231, 396
Netherlands, The: 340, 348, 349, 361
Nevada: 386
Newburg, Oreg.
  Municipal waste plant: 51
  Paper mill pollution: 49
Newburg, Oreg.—Continued
  Secondary sewage treatment facilities: 53
  Willamette pollution at: 48
New England Natural Resources Center: 386
New Haven, Conn.: 36
New Hampshire: 391
*New Hope Dam* Case: 239
New Jersey: 134, 137, 157, 205, 216, 219, 311, 312, 391
New Mexico: 248, 386
New Orleans, La.: 24, 26, 27, 203
New York
  Adirondacks: 218
  Growth controls: 222
  Land use control laws: 214
  Local conservation commissions: 391
  Mt. Marcy: 218
  Pollution control bond issue: 251
  Recreational land sales: 219
  State impact statement procedures: 248
  Taking issue: 138
New York Bight: 335
New York City
  Air quality plan: 157
  Grand Central Terminal: 123, 124, 142
  Metropolitan Opera House: 141
  Noise control code: 200
  Open space: 15
  Ruppert Brewery: 34
  Solid waste disposal funds: 173
  Solid waste management: 205
  Space studies: 13
  Volunteers in Parks: 388
Ngorongoro Crater (Africa): 342
Niagara Falls: 289
Nitric Acid: 160
Nitrilotriacetic Acid (NTA): 188
Nitrogen Oxides: 166
Nixon, President Richard M.
  Agreement with USSR: 365
  Energy Message: 162, 207, 210, 213, 448
  Great Lakes Agreement: 338
  Land use: 126
  Natural Resources and Environment Message, 1973: 440
  Ocean dumping policy: 335
  Outer continental shelf: 210
  Safe drinking water: 180
  Solid waste construction veto: 172
  Water quality permit program: 174
  World Heritage Trust: 347

- Noise Pollution
  - Aircraft: 97
  - Construction equipment: 199
  - Cost estimates: 97
  - Electric equipment: 199
  - Law suits: 198, 199
  - New attitude toward: 197
  - Scope of problem: 195
  - *See also* Transportation.
- Noise Control Act of 1972: 197, 198
- North Carolina: 231, 247, 263, 391
- Norway: 344
- Northwestern National Life Insurance Co.: 9, 10
- NTA (Nitrilotriacetic Acid): 188
- Nuclear Energy
  - Discharges from powerplants: 191, 193, 194

**O**

- Oak Ridge Air Quality Index: 275
- Oak Ridge National Laboratory: 264, 296
- OBERS Projections: 235
- Ocala National Forest: 228
- Occupational Health: 185, 186, 189, 337, 338
- Ocean County, N.J.: 311
- Ocean Dumping. *See* Marine Pollution.
- *Ocean Dumping — A National Policy* (CEQ): 178, 335
- Ocean Eagle: 330
- Ocean Pollution. *See* Marine Pollution.
- Office of Energy Conservation: 212
- Office of Interstate Land Sales Registration: 219
- Office of Science and Technology: 188
- Ohio: 380
- Oil, Chemical and Atomic Workers: 377
- Oil, Imports of: 210
- Oil Pollution
  - Atlantic Ocean: 330
  - Early efforts at control: 331, 332
  - International convention's: 332, 333
  - Recent efforts at control: 332
  - Tanker design and: 333
  - U.S. position on: 334
  - *See also* Marine Pollution.
- Oil Shale: 211
- Oklahoma: 310
- Oklawaha River. 228
- Onthank, Karl: 62
- Orange County, Calif.: 311
- Oregon
  - Citizen action: 385
  - Growth control: 222
  - Land use and water quality: 69
  - Solid waste management: 205
  - State land use law: 216
  - State land use planning system: 66
  - Willamette and: 57
- Oregon Agricultural College: 48
- Oregon Citizens for Clean Air: 385
- Oregon City, Oreg.: 44
- Oregon Environmental Council: 385, 391
- Oregon State Planning Board: 50
- Organization for African Unity: 365
- Organization for Economic Cooperation and Development: 188, 340, 363, 364
- Oslo Convention: 336
- Outer Continental Shelf: 210

**P**

- Pacific Ocean: 294, 317
- Palm Beach, Fla.: 221
- Paper Industry: 280
- Parris Island, N.C.: 204, 205
- PCB. *See* Polychlorinated Biphenyls.
- Pennsylvania: 193, 219
- *Pennsylvania Coal Co.* v. *Mahon*: 129, 132, 133, 137, 143–145
- Perham, Minn.: 201
- Pesticides
  - Control legislation: 182
  - Field reentry standards: 185, 186
  - Implementation of legislation: 184
  - Law suits: 185
  - Marine pollution: 294, 336
  - New legislation on: 183
  - Number in U.S.: 183
  - Regulatory actions: 184, 185
  - U.N. program on: 368
  - *See also* Integrated Pest Management.
- Phenols: 285, 286
- Philadelphia, Pa.
  - Air quality plan: 159
  - Elfreth Alley: 24
  - Emission of air pollutants: 267, 269
  - Neighborhood fragmentation: 34
  - Neighborhood renewal: 25
  - Penn Center: 5
  - Society Hill restoration: 9
  - Street closing: 16
  - Vest pocket parks: 34
- Phosphorus: 177, 178
- Pike Plaza, Seattle: 247
- Pinchot, Gifford: 375

Pittsburgh, Pa.
  Heinz Hall: 12
  Homestead-Brushton Clean-Up Coalition: 379
  Neighborhood renewal: 31
  Renewal in: 2
Planned Parenthood: 385
Plastic Pollution: 293, 330
Plato: 341
Pleasanton, Calif.: 222
Podgorny, Nicolai: 365
Point Barrow Observatory, Alaska: 277
Poland: 367
Pollution (General)
  Effects on various income groups: 80
  Investment spending study: 88
Polychlorinated Biphenyls: 182, 188, 294, 336, 364
Population
  Density curves: 304
  Less-developed nations: 323
  Projections: 322, 323
  Total fertility rate, 1972 (U.S.): 321, 322
  Trends (U.S.): 321
Port Huron-Sarnia: 339
Portland, Me.: 9
Portland, Oreg.
  City Club: 57
  Civil War era trade: 60
  Dissolved oxygen in harbor: 48, 53
  Harbor Drive: 67, 68
  John's Landing: 69
  Lovejoy Plaza: 13, 14
  Municipal sewage plant: 51
  Post-World War II pollution control efforts: 51
  Sanitary Authority law suit (1960): 54
  Shifting land use: 67
*Powell* v. *Pennsylvania*: 144
Powerplants. *See* Energy.
Predator Control: 225
President's Environmental Merit Awards Program: 383
President's Special Award for Environmental Excellence: 383
Private Property. *See* Land Use.
Project on Clean Water: 389
Project Safeguard: 185
Public Domain. *See* Land Use.
Puerto Rico: 233
Puget Sound: 339
*Pumpelly* v. *Green Bay Company*: 129, 130

**R**

Radiation
  Control philosophy: 190, 191
  Cost estimates: 97
  Effects of: 189
  Emergency core cooling systems: 193, 194
  EPA guidelines: 190
  Exposure standards: 190
  Medical exposure: 195
  New regulations: 97
  Research on: 189, 190
Rainy River: 339
Ramapo, N.Y.: 124, 138
Real Estate Research Corporation: 18
Recreation: 86
Recreational Land. *See* Land Use.
Recycling: 201, 202, 249, 392–394
Red River: 339
Refuse Act of 1899: 174, 280
Regional Organizations. *See* International Environmental Action.
Research Advisory Board: 339
Resource Recovery. *See* Recycling.
*Resource Recovery—The State of Technology* (CEQ): 202
Richmond, Va.: 3
Resources and Land Information (RALI): 264
Resources for the Future, Inc.: 361
Rhine River: 340
Rhode Island: 391
River Rouge, Mich.: 204
Riverside, Calif.: 303, 309, 310, 320
Rochester, N.Y.: 157
Rockland County, N.Y.: 247
Rocky Mountain Center on Environment: 386, 402
Roosevelt, Theodore: 375
Rotterdam, The Netherlands: 363
Rumania: 341
Rutherford County Conservation Council (N.C.): 390

**S**

Sacramento, Calif.: 159
Safe Drinking Water Act of 1973: 180
Saginaw Bay: 291
Sakharov, A. D.: 365
Salem, Oreg.
  Dissolved oxygen level: 45
  Municipal sewage plant: 51
  Secondary sewage treatment facilities: 53
  Solid waste pollution of Willamette: 49

Salisbury, Md.: 15
San Antonio, Tex.: 17, 19, 35, 157
*Sanbornton. See Steel Hill Development Corp.* v. *Sanbornton.*
Sanbornton, N.H.: 124
San Diego, Calif.: 159, 203, 263
San Francisco, Calif.
  Air quality plan: 159
  Ghirardelli Square: 18, 20
  Growth moratoria: 125
  High-rise buildings: 6
  Organic lead: 201
  St. Francis Square complex: 36, 37
  Taking issue: 13
San Francisco Bay Conservation and Development Commission: 377
San Jose, Calif.: 29
Santa Barbara, Calif.: 330
Santa Barbara oil spill: 380
Savannah, Ga.: 24, 25
Savannah River: 246
Scientific Committee for the International Biological Programme: 362
*Scientists' Institute for Public Information* v. *Atomic Energy Commission*: 241
*SCRAP* v. *United States*: 239–241
Seattle, Wash.: 11
Sequoia National Forest: 394
Serengeti Plain (East Africa): 347
Shell Oil Company: 377
Sierra Club
  Bridge Canyon and: 376
  Earth Day and: 380
  Founding of: 375
  Information dissemination: 389
  Interests of: 386
  Legal actions of: 394
  Liquid natural gas import facility case: 395
  Lobbying activities: 390
  Urban Environment Conference and: 378
*Sierra Club* v. *Froehlke*: 237
*Sierra Club* v. *Morton*: 240
Small Business Administration: 11, 360
Smithsonian Institution: 224
"Social-Environmental Audit": 264
Soil Conservation Service: 247, 315–317
Soil Conservation Service of North Carolina: 237
*Soap and Detergent Ass'n.* v. *Chicago*: 178
Solid Waste Disposal
  Construction grant veto: 172
Sierra Waste Disposal—Continued
  Cost estimates: 96
  Deadline for waste treatment plans: 170
  Economic principles in: 173, 174
  EPA grants and activities: 200
  Federal funding for construction: 172
  Federal grant program: 171
  Federal role: 200
  Hazardous wastes: 201, 202
  Importance of public treatment facilities: 172
  Law suits: 173, 175
  Management of: 204
  Pretreatment standards: 170, 175
  Priorities in public funding: 176
  Private spending: 96
  Public spending on: 96, 97
  Scope of problem: 200
  Technology for: 249
  *See also* Recycling.
South Pole: 277
Soviet Union
  Agreement with U.S.: 365
  Black Sea pollution: 340
  Cooperation with U.S.: 349
  Internal environmental programs: 348
  Pest management cooperation: 187
  Whaling and: 345–347
Spain: 367
Sport Fishing Institute: 386
Springfield, Ill.: 15
Springfield, Oreg.: 47, 49
St. Croix River: 339
St. John River: 363
St. John River Basin: 339
St. Louis, Mo.: 11, 203, 363
St. Paul, Minn.: 18
St. Petersburg-Tampa, Fla.: 221
Steamboat Lake, Colo.: 247
*Steel Hill Development* v. *Sanbornton*: 139, 148, 149
Stonehenge (United Kingdom): 347
Strategic Environmental Assessment System: 297
Straub, Robert: 57
Strong, Maurice: 368
Students Challenging Regulatory Agency Procedures (SCRAP). *See SCRAP* v. *United States.*
Sulfur Oxides: 161, 162
Sulfuric Acid: 160
Surplus Property Act: 11
Susquehanna River: 219
Sutherland, Justice George: 131
Sweden: 348, 357, 360, 363

Switzerland: 357
Syracuse, N.Y.: 157

T

"Taking issue." *See* Land Use.
Task Force on Land Utilization and Urban Growth Policy: 248
Tennessee: 247
Tennessee Valley Authority: 391
*The Quiet Revolution in Land Use Control*: 214
*The Use of Land—A Citizens' Policy Guide to Urban Growth*: 220
Thoreau, Henry David: 374, 389
*Time and the River Flowing*: 376
*To Live with the Earth*: 385
Toledo, Ohio: 159
*Torrey Canyon*: 330, 333
Toxic Substances
  Chloroethers: 189
  Definition: 182
  Disposal of: 179
  Effluent standards: 175
  Haloethers: 189
  Lack of legislation on: 182
  Lists of: 170
  Pending legislation: 187, 188
  *See also* Pesticides; Polychlorinated Biphenyls.
Toxic Substances Control Act: 187, 189
Toyo Kogyo: 164
Train, Russell E.: 366, 405
Trans-Alaska Pipeline: 228
Transboundary Pollution. *See* International Environmental Action.
Transportation
  Control strategies: 159
  Noise
    Aircraft: 197
    Law suits: 198, 199
    Regulation of: 198
  Pollution from: 266
  Urban: 157
Transportation, Department of
  Aircraft and airport noise: 199
  Impact statements: 242, 245
  Noise control costs: 97
Trinity River Basin: 237
Trophic System: 288
Trudeau, Pierre Elliot: 338
Tualatin Valley, Oreg.: 59
Tunisia: 367
Turin, Italy: 363
Turkey: 340
*Turnpike Realty* v. *Town of Dedham*: 135

U

Union Camp Corporation: 231, 232
Union Electric: 203
United Auto Workers: 378
United Kingdom: 348, 349, 363, 367
United Nations
  Conference on the Human Environment: 277, 346
  Environmental Fund: 369
  Environmental programs: 367, 368, 370
UNESCO: 347
United States
  Pollution control costs: 357, 359, 360
  USSR and: 349, 365
U.S.-Canadian Committee on Water Quality Planning in the St. John River Basin: 363
U.S.-Canadian Great Lakes Water Quality Agreement: 336, 338, 370
U.S.-Canadian Treaty for the Protection of Migratory Birds (1916): 343
Upper French Broad Defense Association (N.C.): 391
Urban Environment
  Attractions to: 22
  Crime and: 23, 38
  Definition of: 302
  Downtown
    Characteristics of: 4
    Criticisms of: 6
    Diversity of: 6
    Dominant forms: 5
    Future of: 39
    Human vitality: 16
    Retailing: 18
    Sidewalks, use of: 15
    Space: 13
    Street closings: 15
    Trends: 18
  Drawbacks of: 22
  Effects of pollution on various income groups: 80, 81, 82
  Environmental action in: 378
  Highways and: 23, 34
  Impact of change efforts on inner city poor: 39
  Impervious surfaces: 318
  Land use problems: 67
  Markets: 11
  Neighborhoods
    Historic: 23, 24
    Renewal communities: 34–38
    Stable: 29
    Studies: 31, 32
  Parks: 32, 232, 233

Urban Environment—Continued
  Suburban population, 1970: 20
  Trends in: 22
  Use of older structures: 9
  *See also* Transportation.
Urban Environment Conference: 378
Utah: 211, 386

**V**

Vail, Colo.: 386
Ventura County, Calif.: 314, 315
Vermont: 193, 205, 214, 219, 222, 377
Virginia: 231, 389, 390
Volunteerism. *See* Citizen Action; Environmentalism.
Volunteers in Parks (New York City): 388

**W**

Wallisville Dam Project: 237, 238
Washington, D.C.
  Canal Square: 18
  Capitol Hill: 27, 28
  Carrying capacity: 295, 296
  Environmental information: 389
  Georgetown: 24
  Median family income: 302, 306
  Old Executive Office Building: 11, 12
  Parks: 33, 233
  Population density: 305
  Relation to Baltimore, Md.: 301
  Rock Creek: 318
  Southwest: 35, 38
  Vehicle emission control plan: 157
Washington, George: 232
Washington State: 217, 251
Waste Management, Inc.: 203
Water Pollution Control Act Amendments of 1972: 101
Water Quality
  Citizen action: 171
  Damage cost estimates: 77
  Damage costs and recreational opportunities: 80
  Effluents: 279
  EPA studies: 284
  Extent of data on: 279
  Federal grants for control facilities: 114–116
  Goals: 180, 181
  Implementation of plans: 176
  Lake eutrophication: 177, 178
  Land use and: 44
  Law suits: 175
  Municipal investment in water treatment facilities: 86

Water Quality—Continued
  National Stream Quality Accounting Network: 283
  Permit program: 174, 175
  Planning process for: 170
  Private investment in controls: 88
  Safe drinking water: 180
  U.S.-USSR cooperation: 367
  Water quality index: 293
  *See also* Great Lakes; Willamette River.
Water Quality Act of 1965: 168
Water Resources Council: 235, 296
Weather Modification: 368
Welland Canal: 289
West Virginia: 403
Wetlands
  Definition of: 134
  Development of: 215, 218, 311
  Importance of: 310, 311
  Patterns of urban growth in: 311
  Taking issue and: 134, 146
Whales: 224, 225, 344
White House Conference on International Cooperation (1965): 347
Wild and Scenic Rivers: 227, 228
Wild and Scenic Rivers Act of 1968: 227
Wilderness Act of 1964: 225
Wilderness Areas
  Current proposals: 226
  Legislation on: 225
  Pending legislation: 227
  Unique wild areas: 228
Wilderness Society: 228, 386, 389
Wildlife
  Dangers to: 344
  Early efforts at control: 341
  Expansion of human population and: 341
  Federal legislation on: 223
  History of pollution: 341
  Marine mammals: 224
  Milu deer: 342
  Recent efforts at protection: 342
  U.S.-USSR cooperation: 366
  *See also* Endangered Species; Predator Control; Whales.
Willamette
  Chinook salmon and: 54, 58, 59
  Citizen role: 59, 60
  Civil War era river traffic: 60
  Description of: 43, 44
  Discovery of: 43
  Dissolved oxygen in: 48, 56, 59
  Early pollution of: 48
  Early pollution control efforts: 50
  Federal grants: 58
  Federal role in: 57

Willamette—Continued
  Further efforts: 54
  Future prospects: 59
  Importance of: 43, 44
  Land use and: 69
  Larger communities which pollute it: 49
  Maps: 45, 46
  Post-World War II pollution control efforts: 51
  Public concern over: 50
  Reasons for success: 55
  Reexamination of efforts: 53
  State role in: 57
  Strip city future: 62
  Surveys of: 48
  Total bacterial count (1929): 49
  *See also* Greenway.
Willamette Falls, Oreg.: 49, 60
*Willamette River Basin: Water Pollution Control and Management:* 58
Willamette River Greenway Association: 385
Willard, Beatrice E.: 405
Wilmington, Del.: 203
Winston-Salem, N.C.: 383
Wisconsin: 147
World Conference on National Parks (1967): 347
World Heritage Fund: 348
World Heritage Trust: 347, 368
World Meteorological Organization: 277
World Weather Watch: 368
Wyoming: 211, 386

**X Y Z**

Yellowstone National Park: 347, 348
Yosemite National Park: 374, 375
Youth Activities: 381
Youth for a Cleaner Environment: 383
Yugoslavia: 367

U.S. GOVERNMENT PRINTING OFFICE : 1974 O - 537-097